

THE
PHILOSOPHICAL
TRANSACTIONS
ABRIDGED.

THE NINTH VOLUME.

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TRANSACTIONS

(From the Year 1732, to the Year 1744)

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VOLUME

THE NINTH VOLUME

PART III. The Anatomical and Medical Papers

AND

PART IV. The Historical and Miscellaneous Papers

LONDON

Printed by W. Innes, C. Hinton, T. Astley, in Pall-mall; and
T. Woodward, C. Davis in St. John's, and R. Mansel and H. S. Jones

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PHILOSOPHICAL
TRANSACTIONS

(From the Year 1732, to the Year 1744)

ABRIDGED,

AND

Disposed under GENERAL HEADS,
The *Latin* PAPERS being translated into *English*.

By JOHN MARTYN, F. R. S.
Professor of BOTANY in the University of *Cambridge*.

VOL. IX.

CONTAINING,
PART III. The ANATOMICAL and MEDICAL PAPERS;
AND
PART IV. The HISTORICAL and MISCELLANEOUS PAPERS.

L O N D O N :

Printed for W. INNYS, C. HITCH, T. ASTLEY, in *Pater-noster-Row*,
T. WOODWARD, C. DAVIS in *Holbourn*, and R. MANBY and H. S. COX on
Ludgate-Hill. MDCCXLVII.

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THE
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(From the Year 1732 to the Year 1744)

A B R I D G E D



By JOHN MARSHALL, F.R.S.
Professor of Botany in the University of Cambridge.

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THE
Philosophical Transactions
ABRIDGED.

PART III.
CONTAINING THE
ANATOMICAL and *MEDICAL*
PAPERS.

CHAP. I.
ZOOLOGY, and the *Anatomy* of *ANIMALS*.

I. **H**AVING heard strange Stories about a Fly-tree, as it is called by some People, from which vast Swarms of Flies have been observed to issue, I desired a Person who went to see it, to bring me some of the fly-bearing Leaves; about the latter end of *June* last he brought me some Leaves, on which was fixed a tough little Bag, as big as the Husk of a Philbert, but is now very much shrunk with drying. It was of a dusky green Colour; I cut it open, and a Fly, like a Gnat, came out of it; I discovered no more Flies, till looking at it with a Glass, I could discern something moving amongst the blueish Pulp, and after a while observed that it contained many red Grubs, very small, without Wings; I bound up the *Nidus*, and next Morning the Grubs had gotten blueish Wings, and their Body was of a greyish Colour; there was a great

Account of a remarkable Generation of Insects; by Mr Richard Lewis, N^o. 429. p. 119. July &c. 1733.

Number of them, but they soon flew away. I went to see the Tree; it's Bark and Leaf resembles a Male Mulberry, the Leaves were plentifully stocked with these Bags; I opened several of them which were plentifully stocked with these Insects. Amongst all the Excrecences which I have seen on Leaves, I have observed none like these. When the Leaf is small they are scarcely discernible, they grow with the Leaf, which is not discoloured or crumpled by them. I have read *Rhedi's* curious Treatise of the Generation of Insects, but found no Account therein of any of their Nests like these.

Annapolis in Maryland,

Oct. 27. 1732.

*Of the Bases
of the Cells
wherein the
Bees deposit
their Honey, by
Mr Mac Lau-
rin, Prof.
Math. Edinb.
F. R. S. N^o.
471. p 565.
Presented Nov.
3. 1743.*

II. The Sagacity of the *Bees* in making their Cells of an hexagonal Form, has been admired of old; and that Figure has been taken notice of, as the best they could have pitched upon for their Purposes: But a yet more surprising Instance of the Geometry of these little *Insects* is seen in the Form of the Bases of those Cells, discovered in the late accurate Observations of Monsieur *Maraldi* and Monsieur *de Reaumur*, who have found those Bases to be of that Pyramidal Figure, that requires the least Wax for containing the same Quantity of Honey, and which has at the same time a very remarkable Regularity and Beauty, connected of Necessity with it's Frugality.

These Bases are formed from 3 equal *Rhombus's*, the obtuse Angles of which are found to be the Doubles of an Angle that often offers itself to Mathematicians in Questions relating to *Maxima* and *Minima*; that is, the Angle, whose Tangent is to the *Radius*, as the Diagonal is to the Side of the Square. By this Construction, of the 6 solid Angles at the Base that correspond to the Angles of the Hexagon, Three are equal as well to each other, as to the solid Angle at the *Apex* of the Figure, each of which solid Angles is respectively formed from 3 equal plane obtuse Angles: And the other 3 solid Angles are also equal to each other, but severally formed each from 4 equal plane acute Angles, Supplements to the former obtuse ones.

By this Form the utmost Improvement is made of their Wax, of which they are on all Occasions very saving the greatest Regularity is obtained in the Construction, and with a particular Facility in the Execution; as there is one sort of Angle only with it's Supplement, that is required in the Structure of the whole Figure.

M. *Maraldi* * had found by Mensuration, that the obtuse Angles of the *Rhombus's* were of 110° nearly; upon which he observed, that if the 3 obtuse Angles which formed the solid Angles above-mentioned, were supposed equal to each other, they must each be of $109^{\circ}.28'$; from whence it has been inferred, that this last was really the true and just Measure of them: And lately M. *de Reaumur* † has informed us, that Mr *Koëning* having, at his Desire, sought what should be the Quantity to be given to this Angle, in order to employ the least Wax possible in a Cell of the same Capacity, that Gentleman had found, by a higher

Geometry

* *Memoires de l' Acad. Royale des Sciences*, 1712.

† *Memoires sur les Insectes*, Tom. V.

Geometry than was known to the Antients, by the Method of *Infinite-simals*, that the Angle in question ought in this Case to be of $109^{\circ}. 26'$, And we shall now make it appear from the Principles of common *Geometry*, that the most advantageous Angle for these *Rhombus's* is indeed, on that Account also, the same which results from the supposed Equality of the three plane Angles that form the above-mentioned solid ones.

Let GN and NM represent any two adjoining Sides of the Hexagon, Fig. 1, 2. that is, the Section of the Cell perpendicular to it's Length. The Sides of the Cell are not complete Parallelograms as $CGNK$, $BMNK$, but *Trapezia* $CGNE$, $BMNE$, to which a *Rhombus* $CEBe$, is fitted at E , and that has the opposite Point e in the *Apex* of the Figure, so that three *Rhombus's* of this kind, with 6 *Trapezia*, may complete the Figure of the Cell. Let O be the Centre of the Hexagon, of which CK and KB are adjoining Sides; join CB and KO , intersecting it in A ; and, because COB is equal to CKB , and KE equal to Oe , the Solid $EBCK$ is equal to the Solid $eBCO$; from which it is obvious, that the Solid Content of the Cell will be the same, wherever the Point E is taken in the Right Line KN , the Points C, K, B, G, N , and M , being given. We are therefore to inquire where the Point E is to be taken in KN , so that the *Area* of the *Rhombus* $CEBe$, together with that of the two *Trapezia* $CGNE$, $ENMB$, may form the least Superficies. Because Ee is perpendicular to BC in A , the *Area* of the *Rhombus* is $AE \times BC$, that of the *Trapezia* $CGNE$, $ENMB$, is $CG + EN \times KC$; these, added to the *Rhombus*, amount to $AE \times BC + 2KN \times KC - KE \times KC$; and because $2KN \times KC$ is invariable, we are to inquire, when $AE \times BC - KE \times KC$ is a *Minimum*?

Suppose the Point L to be so taken upon KN , that KL may be to AL as KC is to BC . From the Centre A describe in the Plane AKE with the Radius AE , an Arc of a Circle ER meeting AL , produced, if necessary, in R ; let EV be perpendicular to AR in V , and KH be perpendicular to the same in H ; then the Triangles LEV , LKH , LAK , being similar, we have $LV : LE :: LH : LK :: LK : LA ::$ (by the Supposition last made) $KC : BC$. Hence, when E is between L and N , we have $LH + LV (= VH) : LK + LE (= KE) :: KC : BC$; and when E is between K and L , we have $LH - LV (= VH) : LK - LE (= KE) :: KC : BC$; that is, in both Cases we have $KE \times KC = VH \times BC$; and consequently $AE \times BC - KE \times KC = AE \times BC - VH \times BC = \overline{AE - VH} \times BC = \overline{AR - VH} \times BC = \overline{AH} + \overline{VR} \times BC$; which, because AH and BC do not vary, is evidently least when VR vanishes, that is, when E is upon L . Therefore $CLBl$ is the *Rhombus* of the most advantageous Form in respect of Frugality, when KL is to AL as KC is to BC . This is the same Method by which we have elsewhere determined the *Maxima* and *Minima*, in the Resolution of several Problems that have usually been treated in a more abstruse Manner. See *Treatise of Fluxions*, Art. 572. &c.

Of the Bases of the Cells

Now because OK is bisected in A , $KC^2 = OK^2 = 4AK^2$; and $AC^2 = 3AK^2$, or $BC = 2AC = 2\sqrt{3} \times AK$; consequently $KC : BC :: 2AK : 2\sqrt{3} \times AK :: 1 : \sqrt{3}$, and $KL : AL :: (KC : BC) :: 1 : \sqrt{3}$, or $AL : AK :: \sqrt{3} : \sqrt{2}$; and (because $AK : AC :: 1 : \sqrt{3}$) $AL : AC :: 1 : \sqrt{2}$; that is, the Angle CLA is that, whose Tangent is to the Radius as $\sqrt{2}$ is to 1, or as 14142135 to 10000000; and therefore is of $54^\circ. 44'. 08''$, and consequently the Angle of the Rhombus of the best Form is that of $109^\circ. 28'. 16''$.

By this Solution it is farther easy to estimate what their Savings may amount to upon this Article, in consequence of this Construction. Had they made the Base flat, and not of the pyramidal Form described above, then, besides completing the Parallelograms $CGNK$ and $BMNK$, the Surface of the Base had been $3CB \times AK$; what they really do form amounts in Surface to the same Parallelograms, and $3CB \times AH$: the

Savings therefore amount to $3CB \times \overline{AK - AH} = 3CB \times AH \times \frac{\sqrt{3} - \sqrt{2}}{\sqrt{2}}$,

which is almost a fourth part of the Pains and Expence of Wax, they bestow above what was necessary for compleating the Parallelogram Sides of the Cells: And at the same time they seem also to have other Advantages from this Form, besides the saving of their Wax; such as a greater Strength of the Work, and more Convenience for moving in these larger solid Angles

It remains that we should shew, that the plane Angles CLB , CLN , and BLN , are equal to each other. We before found, that $KL : AL :: KC : BC :: KA : (\frac{1}{2} KC) AC$; consequently $KL : KA :: AL : AC$, and the Triangles LKA , LAC , are similar: Therefore $LK : AL :: AL : LC :: KC : BC :: 1 : \sqrt{3}$, and $LC = 3LK$. With the Centre L and Radius LC , describe in the Plane $CGNK$ the Semicircle DCP , meeting the Line KN , in D and P ; join CP and CD , and let LQ be perpendicular to CP in Q , then will the Angle CDK be equal to QLP , and we shall have $PQ : LQ :: PC : DC :: \sqrt{PK} : \sqrt{DK} :: \sqrt{LC + LK} : \sqrt{LC - LK} :: \sqrt{4} : \sqrt{2} :: \sqrt{2} : 1 :: AC : AL$. Consequently the Angle $QLP = ALC$, and $CLP = CLB$, or the obtuse Angle of the Rhombus $CLBl$ is equal to CLP , the obtuse Angle of the Trapezium; and consequently, the three plane Angles that form the solid Angle at L , or the Apex at l , are equal to each other: From which it is obvious, that the 4 acute plane Angles, which form the solid Angle at C or B , are likewise equal among themselves.

Though M. Maraldi had found, by his Mensuration, these obtuse Angles to be of about 110° ; the small Difference between this and the $109^\circ. 28'. 16''$, just found by Calculation, seems to have been either accidental, or owing to the Difficulty of measuring such Angles with Exactness: Besides that he seems to admit the real Equality of the several plane Angles, that form as well the Apex, as the other solid ones we have been

treating of. And, as to the fmall Difference between our Angle and that determined by Mr *Koëning*, who firft confidered this Problem, but has not yet published his Demonftration of it, that can only be owing to his not carrying on his Computation fo far, and would fcarcely have been worth the mentioning, were it not yet in Favour of the Practice of thefe induftrious little Infefts; and did it not therefore give us ground to conclude, that in general, and when the particular Form and Circumftance of the Honey-comb does not require a Variation from their Rule, the *Bees* do truly conftitute their Cells of the beft Figure, and that not only nearly, but with Exactnefs; and that their Proceeding could not have been more perfect from the greateft Knowledge in *Geometry*. How they arrive at this, and how the wonderful Inftinct in Animals is to be accounted for, is a Queftion of an higher Nature; but this is furely a remarkable Example of this Inftinct, as it has fuggested a Problem that had been overlooked by Mathematicians, though they have treated largely on the *Maxima* and *Minima*; and fuch an one, as has been thought to exceed the Compafs of the common *Geometry*.

It may be worth while to add here, that if the Cells had been of any other Form than hexagonal, and the Bafes had ftill been pyramidal, thefe muft have been terminated by *Trapezia*, and not by *Rhombus's*, and therefore had been lefs regular, becaufe *OA* and *AK* would have been unequal: Nor could there have been room for fuch an advantageous or frugal a Conftitute as that we have defcribed, becaufe the folid Content of the Cell would have increafed with the Right Line *KE*. The Cells, by being hexagonal, are the moft capacious, in proportion to their Surface, of any regular Figures that leave no Interftices between them, and at the fame time admit of the moft perfect Bafes. Thus, by following what is beft in one refpect, unforefeen Advantages are often obtained; and what is moft beautiful and regular, is alfo found to be moft ufeful and excellent.

III. Among the remarkable Obfervations of the Year 1732, none is more worthy to be related, than the Deftitution of the Caterpillars and Grafs-hoppers, which feveral Years ago miferably fpoiled the Fruits of the Earth, in the northern Part of the Circle of *Saxony*, in the Marquifate of *Brandenburg* and *Lufatia*, and perhaps in other Places. Both thefe Sorts of Infefts came out in incredible Multitudes, in the Spring of the Year 1732. The Caterpillars, in many Places, devoured almoft all the Leaves of the Trees, as well wild as cultivated; and the Grafs-hoppers alfo threatened as great a Devaftation as they had made fome Years before. Therefore the Country People began to dig Pits, and to gather the Grafs-hoppers before their Wings were ftrong enough to fly, and to throw them into the Pits and bury them. But this Labour of the poor Husbandmen would have availed but little, if it had not pleafed God to weary thefe Infefts, with fuch Inclemencies of Weather, that they all perished in a fhort Time, about the Beginning of Summer, before they had laid their Eggs. For after a gentle Warmth

A Relation of the Deftitution of the Caterpillars and Grafs-hoppers, which fome Years ago deftroyed the Country, near Wittemberg, by Jo. Fred. Weideler, F. R. S. No. 432. P. 294. Apr. Ec. 1734.

about

Of the Destruction of the Caterpillars and Grass-hoppers.

about the Beginning of *April*, O. S. had brought these Insects out early, the severe cold of some Nights, *April* 15, 16, 17, and 18, and cold heavy Showers on *April* 22, and *May* 19, and then almost continual Rains about the End of *May*, and great Part of *June* and *July*, hindered these noxious little Animals from increasing the Bulk and Strength of their Bodies as usual. The Grass-hoppers particularly, which cannot endure much Moisture, at the Beginning of *July*, were found in great Numbers dead in the Fields; and many of them, which escaped drowning, had leaped upon the longer Stalks of the Herbs and Flowers, and hung down from them dead, fastened by their Mouths. That this was the probable Cause of the Death of the Grass-hoppers, appears from this Observation; that those Insects kept to the highest and most dry Fields, where they also made their Nests, and always avoided the low Vallies. I must not omit the Figure of these Grass-hoppers, which shewed them to be a different Species from the green ones, which are seen every Year in small Numbers, in the Meadows and Corn-Fields. Their Heads and Backs were black, and in some grey, distinguished with yellow Specks; their Belly was yellow; and the Muscles of their hinder Feet were red; which when they flew, made them appear purple. The Length of the Body of most of them, did not exceed an Inch and a half; but in *August* 1732, I found some that were above two Inches of a geometrical Foot long. In the same Month they coupled; and one female would contain above 30 Eggs. They laid their Eggs in Holes made in the Earth; and the Females died in them about the End of September. I was told, that four Years ago, when they travelled hither from *Poland*, through *Lusatia* and the Marquisate, they flew high in the Air in Troops, above the Houses and Towers, so as to appear at a Distance like a Cloud. Wherefoever they rested, they covered the whole Ground, and spread themselves far and near. They did the chief Damage in the higher Grounds near *Wittemberg*, for they did not penetrate into the Valley near the City, but kept themselves on the Hills about 1500 Paces off, and thence spread themselves towards the Marquisate and *Lusatia*. They were fond of the soft Tops of the Ears of Corn, and for the more convenient devouring of them, pulled off the entire Ear before it was ripe, which they did chiefly by Night. I have been assured by Persons of Credit, that most of the Ears of a whole Acre have been often thus pulled down in one Night; so that in some Places the poor Husbandmen did not recover so much as their seed.

A New Species of Insect,
by Jac. Theod.
Klein, Secr.
to the Republic of Dantzick, and
F. R. S. No.
447, p. 150.

IV. 1. This Aquatic Insect was sent me from *Uderwang* in the Eastern *Prussia*. On account of it's great Number of Feet, and the Swiftnefs of it's Motion, I may call it *Scolopendra Aquatica scutata* with greater Propriety than *Aldrovandus* called a cetaceous Fish, *Scolopendra cetacea*.

Fig. 4. represents the Insect on the upper Part, covered with it's Sheath, which is something like the Shape of a Tortoise; only it is a little

Fig. 1.

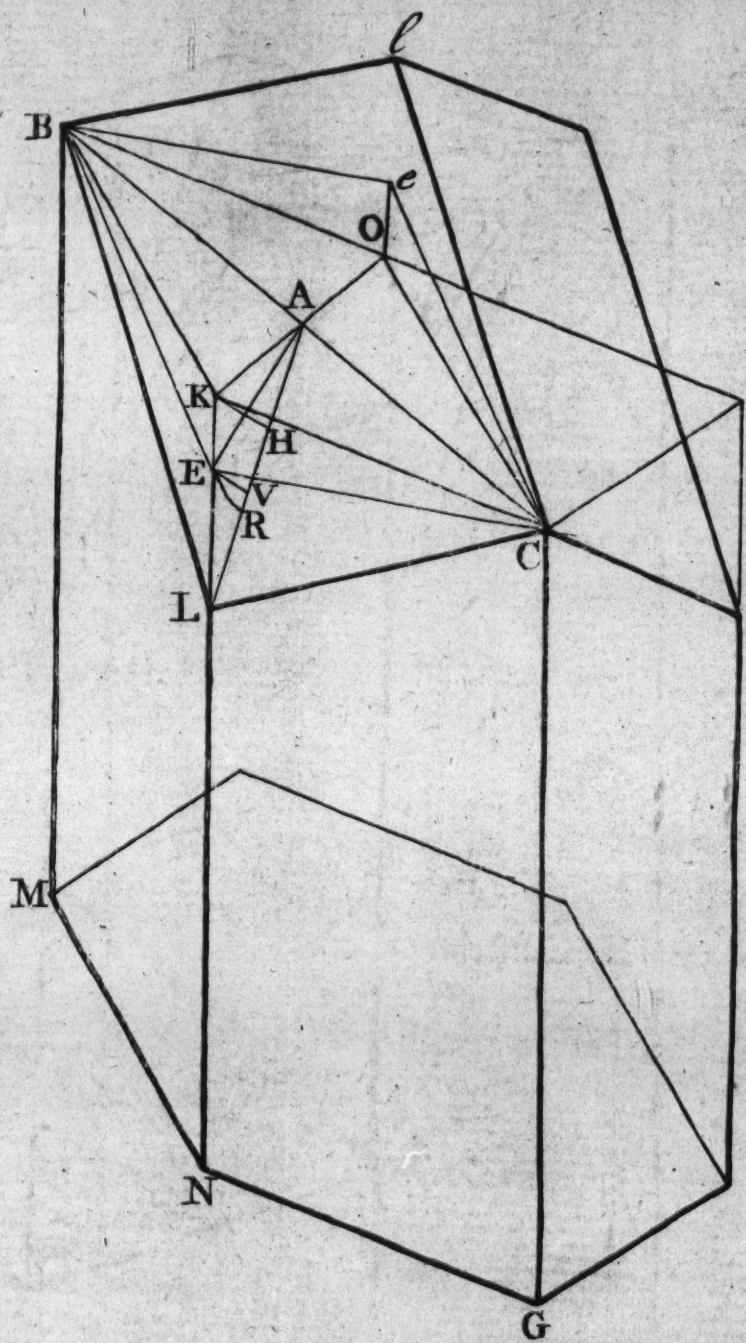


Fig. 2.

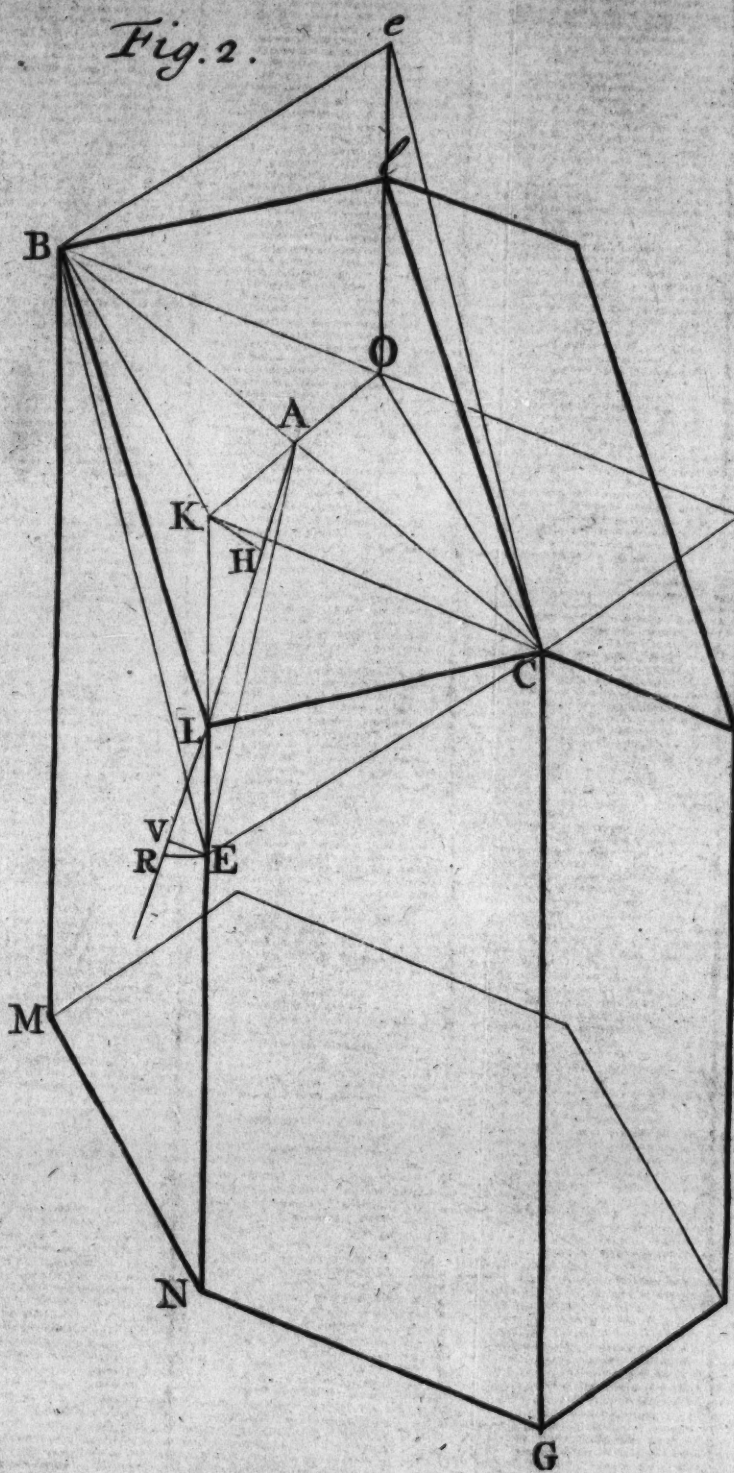
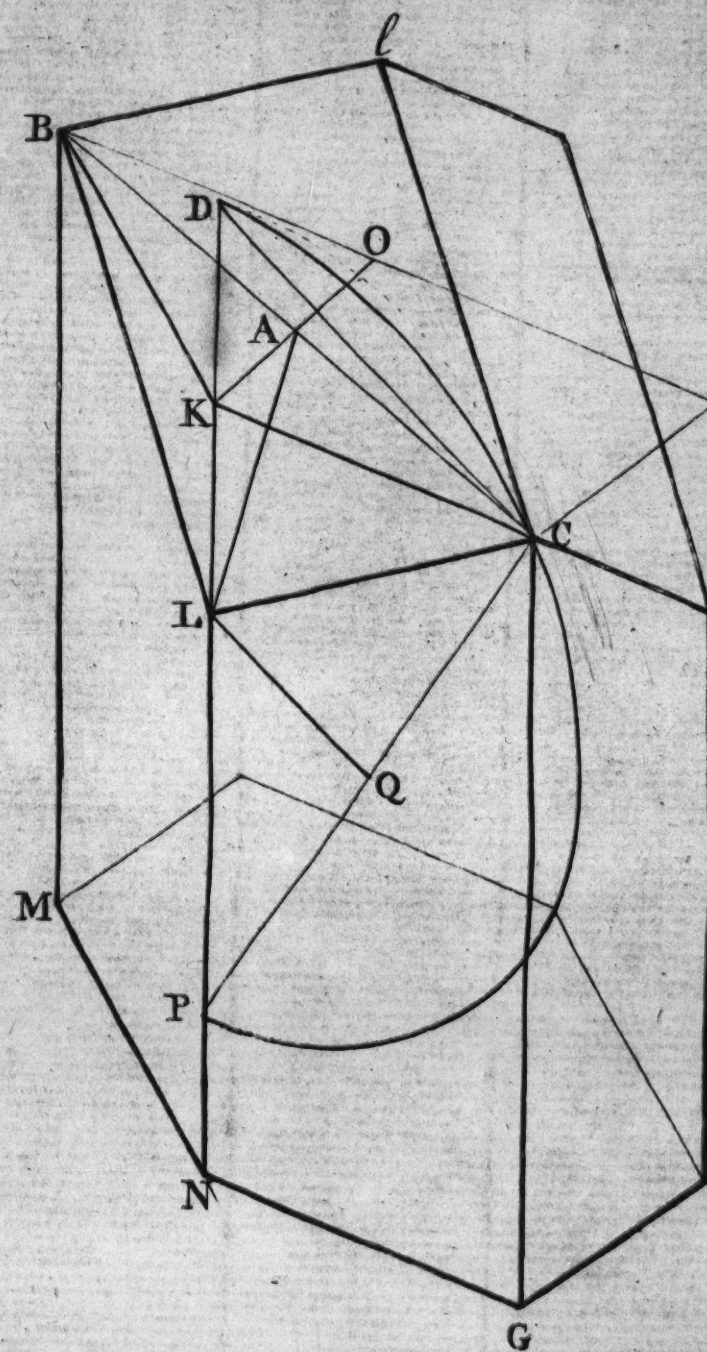


Fig. 3.



p[®]

little elevated longitudinally in the middle of the Back, and towards the Extremity of the Body opens with a triangular Section, and is slightly denticulated; it is entire, and almost of the same Substance with the Sheaths of *Goedart's* Beetle, which comes from the Corn-worm, or of that which we call the *Rose Beetle*, but it's Colour is rather paler. The Eyes pass through the Sheath, and rise a little above it.

Fig. 5. represents the under Part, with it's great Number of Legs; each of these under the *Tibiae* has a *Sacculus*, *Fig. 7.* and ends in three Feet or Claws. The three Feet of the two fore Legs are longer than those of the other Legs, though they are not of equal Length with Respect to each other. All the Divisions of the Feet are jointed like the Bristles of the bifid Tail of this *Scolopendra*, or like the *Antennae* of other Insects.

Fig. 6. Represents the Body of the Insect, with the Sheath raised up. In the thin Cuticle of the lower Part of the Sheath, on both Sides, there are Apertures, as if made with a Needle. Whether the Insect draws in the Water into the Cavity where the Sheath is elevated, and emits it again, or whether it fills the Cuticle with Air, and empties it again, when it would sink or rise in the Water, I cannot certainly affirm. It has about 30 Infections, but I could not easily count the Number of Legs, because, having but one Specimen, I was loth to destroy it. At the Extremity of the Body, which separates the Sheath, the Rings of the Infections are set with little Spines, as they are drawn in *Fig. 4*, and *6*.

Fig. 7. Shews one of the Legs next the Fore-ones, with it's *sacculus*; it is represented in another Situation in *Fig. 5*.

As long as this Insect continued alive, it moved it's Feet with a continual and singular Quickness, and drew it's Body into the Sheath, and thrust it out again. I have not been able to find the least Mention of it in Authors.

2. I have sent a Creature, whose Name I cannot learn from any Books or Persons I have yet met with, to be kept in the Museum of the Royal Society. I brought it from a Pond upon *Bexley Common* last *Saturday*, where great Numbers have been observed for these 5 Weeks past: The Pond was quite dry the 24th of *June*, but upon it's being filled with the great Thunder-shower upon the 25th, within two Days the Pond was observed to swarm with them, by a Farmer watering his Cows there: And what I thought observable, there is no Duct or Channel that could convey them from any adjacent Place.

3. The Legs of this Insect are very extraordinary; I counted 42 on a Side in one of those found in *Kent*; the 20 next the Head are nearly of a Size, but then they grow gradually smaller and smaller towards the Tail. I took out one of the larger ones of the Left Side of the Chest; the Foot consists of five flat membranous Claws, with a stiff Rib along their Middle, and beset with Hairs on the Edges, like those of Crabs; on the lower Side of the Leg hangs an oval Bag, and beyond that grows a large

Jan. &c.
1738.
Fig. 4.

Fig. 6.

Fig. 7.

Concerning the same Sort of Insect found in Kent, by the Rev. Mr. Littleton Brown, F.R.S., dated Aug 9. 1737. Ibid. p. 153.

An Addition by Cromwell Mortimer, M. D. R. S. Secr. Ibid. Fig. 8.

a large thin Membrane, which can be extended by a bony Rib that runs cross it; this Membrane and the whole Foot, is convex on the Side next the Head, and concave on that next the Tail; the Thigh, or first Joint of the Leg, is webbed on each Side; so that the whole Structure of the Legs seems to shew that they are rather designed for swimming with, than walking. The Leg represented in *Fig. 8*, was drawn, when the Insect lay on it's Back, as in *Fig. 5*. Many Parts of this Insect, tho' no bigger than the Figures, have some Resemblance to those of the *Molucca Crab*.

Experiments
and Obser-
vations on a
Beetle, that
lived 3 Years
without Food:
by Mr Henry
Baker. N^o.
457. p. 441.
July &c.
1740.
Fig. 9.

V. In the Middle of *June* 1737, being at *Tottenham* in *Middlesex*, a large Cistern of Lead, that was placed in the Coach-house-yard, to receive by Pipes the Rain-water from some Out-buildings, fell down, through the Failure of a wooden Frame whereon it stood. My Curiosity led me to examine into it; and at the Bottom of it, I observed several black * *Beetles*, plunging in a muddy slimy Sediment, which the Water had left. Taking out 2 or 3 of them, I found them of a middling Size, somewhat above an Inch in Length, having 6 pretty long Legs, with 2 little Hooks at the Extremity of each, in the Manner of the common *Beetles*; They were all over of a rusty black Colour, with *Antennæ* long and jointed; a Body covered with one strong Shell, forming an Appearance of Case-wings, but undivided, and without any filmy Wings underneath, and a Tail turning up a little: In short, they resemble very much a Sort of *Beetle* that is sometimes seen in Houses, but were of a stronger and much more firm Contexture.

As I have preserved most of our *English* Insects, I chose one of the largest of these *Beetles*, and threw it into a Cup full of common *Lamp-Spirits*, (that being the Way of killing and preparing them for my Purpose) and in a few Minutes it appeared to be quite dead: Whereupon I shut it up in a round Pill-box of about an Inch and half Diameter, and carried it in my Pocket next day to *London*, where I tossed it into a Drawer, and thought no more of it for above 2 Months after; when opening the Box, I found it, to my great Surprise, alive and vigorous; though it had nothing to eat for all that Time, nor received any more Air than what could be met with in so small a Box, whose Cover shut up very close. Having, however, no Intention of keeping it alive, I again plunged it into *Spirit of Wine*, and let it lie considerably longer than the first time, till supposing it dead beyond any Possibility of Recovery, I put it into the Box again, and locked it in my Drawer, without looking any more at it for a Month at least, when I found it again alive. And now I began to imagine there must be somewhat extraordinary in this Creature, since it could survive the Force of *Spirit of Wine*, which soon kills most other Insects, and live for 3 Months, without taking in any Sustenance.

* *Scarabæus impennis tardipes*, the slow-legged Beetle. *Moff.* 139. *Fig. Id. Angl.* 999. *Pet. Gaz.* Dec. 3. Tab. xxiv. 7.

A few Days before this, a Friend had sent me 3 or 4 *Cock-Roches*, or as *Merian* calls them, *Kakkerlaccæ*, brought alive from the *West-Indies*: These I had placed under a large Glass of 6 or 7 Inches Diameter, made on purpose to observe the Transformation of *Caterpillars*: I put my *Beetle* amongst them, that he might enjoy a greater Share of Liberty than he had done for 3 Months before. I fed them with green *Ginger* moistened in Water, and they eat it greedily; but I could not find, nor do I believe, that the *Beetle* ever tasted it during the whole 5 Weeks they lived under the Glass together. I often took notice, that the *Cock-Roches* would avoid the *Beetle*, and seem frightened at his Approach; but never observed any Tokens of his Liking or Dislike of them, for he usually stalked along, without regarding whether they came in his Way or not. Perceiving the *Cock-Roches* begin to decline in Vigour, I was afraid they would lose much of their Beauty, if I permitted them to die of Sicknes, and would become unfit to be preserved as I proposed: Wherefore I put them into *Spirit of Wine*, and the *Beetle* their Companion with them. They appeared dead in a few Minutes, and I believe were really so: The *Beetle* seemed likewise in the same Condition: Whereupon, after they had lain in *Spirits* about an Hour, I took them out, and whelmed the Glass over them, till I should have Leisure to dispose of them as I intended. This was about 10 in the Morning, and I saw them no more till Evening, but found the *Beetle* then creeping about as strong and vigorous as ever: And therefore I resolved to put him to a Trial I imagined he could not possibly survive, which was to let him remain a whole Night in *Spirits*; but here too I found myself mistaken, for after he had been taken out a Day, he appeared as lively as if nothing had happened to him.

Since that time I have put him no more in *Spirits*, but have kept him under the Glass afore-mentioned, where he is alive at present: Though during the 2 Years and half he has been in my Possession, I have never been able to discover, that he has drank or eaten any thing.

I must not conceal, however, that, by way of Experiment, I have put under his Glass, at different times, Water, Bread, Fruits, &c. but I never found them in the least diminished or touched by him. These Trials too were always made at many Months asunder, and I am pretty certain, there has been at least a Year together, during some Part of the aforefaid Time, wherein nothing has been offered him either to eat or drink.

The Question will then be, How this Creature has been wonderfully kept alive for two Years and an half, without taking any visible Food? Dr *Alex. Stuart's* Supposition, that it finds it's Nourishment in the Air, carries with it the highest Probability: Since, as he was pleased to observe, there are Particles in the Air which evidently supply a Growth to Plants of some particular Kinds, such as the *Sempervive*, *Orpine*, *House-leek*, &c. And the same or some other Particles therein contained

may possibly be likewise able to afford a Nourishment to Animals of some certain Kinds. There is a farther Reason also to believe, that something like this must be; for, in the amazing Plan of Nature, the *Animal, Vegetable, and Mineral* Kingdoms are not separated each from other by wide Distances, or broken off by sudden Starts, but differ from each other (near their Boundaries) by such minute and insensible Degrees, that it is impossible to find out certainly where the one begins, or where the other ends. As the Air, therefore, yields Nourishment to some Kinds of Plants, it may probably do the same to some Kinds of Animals; for otherwise a Link would seem wanting in the mighty Chain of Beings. And that *Cameleons, Lizards, Snakes, &c.* can live for Months together without any visible Sustenance, is a Fact generally allowed to be true; the Cause of it too has been attributed to an exceeding slow Digestion, Circulation, and Distribution of Nourishment, in those Creatures; but as their Agility seems to imply a brisk Motion of their *animal Spirits*, I am inclined to think the Circulation of their other Fluids cannot be so sluggish as commonly is supposed: And, perhaps, it may not be unreasonable to believe, that their being able to live so long without visible Food, is rather owing to some other Nourishment they receive from the Air, which supplies the want of more substantial Diet.

I have met with no Instance I could give Credit to, of any Creature's living without Food for so long a time as the *Beetle* I have been mentioning; and yet I doubt not (though it may have been kept alive by Air only) but that, in it's natural State, it eats more solid Food; after somewhat the same Manner as the Plants before named thrive best when set in a little Earth, notwithstanding they may flourish a long while, and send forth Branches and Flowers, when they are suspended in the Air, and receive no Nourishment but from the Humidity or some other Qualities thereof.

We have not, indeed, as yet, many Instances of this Sort in Animals; nor is it probable any of the larger Kinds can live long without Supplies of Food: But there may be several Insects capable of subsisting on minute Particles carried about every-where with the Air, though, for want of sufficient Experiments, we are not acquainted with them.

It's reviving so often after being seemingly killed by *Spirit of Wine*, shews a Strength of Life I never found in any other Insect: Some Kinds, indeed, will come to Life again, if taken out as soon as they appear dead; and the *Ear-wig*, in particular, after continuing so some Minutes: But half an Hour in *Spirits* puts a final End to the Life of all the *Insects* I ever tried, except this *Beetle*.

It walks not much about under the Glass that covers it, but is usually found with it's Nose thrust close down to the Bottom thereof, perhaps to suck in the Air. On removing the Glass, it appears robust and vigorous, and would willingly run away. A strong aromatic kind of Smell

Smell issues from it, agreeable enough when there is not too much of it; and the same Scent hangs about the Fingers a long while after touching it. Since the Weather has been so excessive cold, it is grown somewhat torpid; but till now has always appeared as lively in cold as in hot Weather, and I have observed it's Smell to be stronger in Winter than in Summer. In the exhausted Receiver, where I have kept it sometimes for half an Hour, it seems perfectly unconcerned, walking about *in vacuo* as briskly as in the open Air; but, upon Admission of the Air, it shrinks it's Legs together, and appears in a Surprise for near a Minute.

We know the *Egyptians* had a high Veneration for the *Beetle*, by their many Images thereof, which are still preserved in the Cabinets of the Curious, and Historians tells us it was one of their Deities: But, as the *Egyptians* were a wise and learned People, we cannot imagine they would shew so much Regard to a Creature of such a mean Appearance, without some extraordinary Reason for so doing: And is it not possible they might have discovered it's being able to subsist a very long Time without any visible Sustenance, and therefore have made it a Symbol of the Deity? In the same Manner as it is probable the *Onion* was held sacred by them, for representing the *Orbits* of the *Planets*.

P. S. This *Beetle* (after being kept half a Year longer) was permitted to get away, by the Carelessness of a Servant, who took down the Glass to wipe it.

VI. About *Michaelmas* 1728, Mr *Bankley*, the Clerk of the Survey at *Portsmouth* shewed me the Insect as represented in *Fig. 10.* and *11.* On opening the Piece of Wood, (which was tied together with a Pack-thread) I found this Animal yet alive, and moving in a large Cavity in the Middle of the Wood, which appeared otherwise sound, having no visible Entrance into it. This *Beetle* being turned out upon a Sheet of Paper, crawled about upon it. Mr *Bankley* gave me the following Account of it: "This Insect was found August 26, 1728, in splitting a Piece of Exotic Wood into two Pieces, cut across the Grain $4\frac{1}{2}$ Inches thick, taken up in the Hold of his Majesty's Ship *Bredah*, when in the Dock at *Portsmouth*, after her Return from the *West-Indies*: It lived upwards of a Month afterwards. The Hole in which it was nourished, was 5 Inches deep, and $2\frac{1}{4}$ Inches by $1\frac{1}{4}$ Inch broad, in the great Piece; 2 Inches deep, and $2\frac{1}{4}$ Inches by $1\frac{1}{4}$ Inch broad, in the smaller Piece. There was not the least Sign of any Defect on the Outside of the Wood, but it appeared very fair and sound; the Inside was porous, having a Grain like *Cedar*, but in Colour not unlike yellow *Sanders*."

On Examination, I found this Insect to be a sort of *Scarabeus* called *Capricornus* from it's long Horns; which in this were very much crumpled, and partly broken off against the Wood, in it's Confinement: It's Wings were likewise crumpled on the same Account. The

An Account of a Capricorn Beetle, found alive in a Cavity within a sound Piece of Wood, by C. Mortimer, M. D. Secr. R. S. No. 461. p. 861. Aug. &c. 1741.

Fig. 10, 11.

A Dissertation on the Worms which destroy the Piles

Females of these Insects usually lay their Eggs in the Crevices of the Bark of Trees : So it is probable, that as soon as this Insect was hatched in Form of a Worm, it gnawed it's Way through the Bark into the Wood ; and that afterwards the Hole it had made in the Wood, closed towards the Outside ; and the Worm still continuing to gnaw deeper, formed the large Cavity ; and then taking it's perfect Form of a Beetle, remained in that hollow Place, where the Sap of the Tree arising, might have supplied it with Nourishment, and even Air ; since it is known, by various Experiments, that Air will insinuate itself, where-ever such Fluids, as contain Air, in them, can penetrate.

I have seen in the magnificent *Museum* of Sir *Hans Sloane*, Bart. a Piece of Wood, found without, having a Cavity within, wherein was found alive a Sort of Beetle, but I think of a different *Species*. It came from *Jamaica*, if I remember right.

*A Dissertation
on the Worms
which destroy
the Piles on the
Coasts of Hol-
land and Zea-
land, by Job
Baster, M. D.
F. R. S.
Translated
from the Latin
by T. S. M.
D. F. R. S.
No. 455.
p. 276. Nov.
&c. 1739.*

VII. §. 1. In the Year 1730, the Persons appointed to take care of the Dikes on our Coasts, observed that the Piles made of the hardest Oak, defending the Coasts of the *Netherlands* against the Sea, were eat through in a few Months, so as to be broken by the least external Force. Surprized at this uncommon and dangerous *Phænomenon*, they enquired into it's Cause, and saw that a Sort of Worms, before that Time very scarce, but now increased to an incredible Number, had in so short a Time eat into those Piles between the highest and lowest Water-Marks, and threatned very great Damage to the Inhabitants of these Countries.

The superstitious Populace immediately persuaded themselves, that this new Genus of Animals was created by the Divine Wrath for punishing the Sins of Mankind : But prying Experience has taught, that those Worms like other Insects, were created in the Beginning ; but now multiplied to an incredible Degree from some unknown Cause.

§. 2. If a Pile of the hardest Oak has stood 6 Months on the Shore, and be taken out in Summer or Autumn, there appears Mud and Filth sticking to it's outward Surface ; which being scraped off with a Knife, discovers a vast Number of Holes, scarcely as large as Pins Heads.

§. 3. If you view this Mud (§. 2.) through a Microscope, you will see,

1. A Number of whitish Points, not bigger than Grains of Sand.
2. Some very small Worms.

The whitish Points seem to be the Eggs of this Insect, and the Worms to be such as are already hatched from them ; and these Worms gradually perforating the outward Surface of the Wood, rendered soft by lying in the Water, made the afore said Holes (§. 2.) and through them worked their way into the Substance of the Wood.

§. 4. A small Style of Whalebone or Lead, thrust into these small Holes, runs strait into them for 3 or 4 Lines, so that it's outer End always makes a right Angle with the Pile : But afterwards, if the Style be

be gently pushed forward, it does not continue in the strait Line, but runs either way, generally upward.

§. 5. But if one of these Piles (§. 2.) be split lengthwise with a Hatchet or Wedge, it is found full of Passages, or hollow cylindrical Ducts, each of which contains a Worm surrounded with a thin testaceous Substance, exactly filling the Duct, and forming it's *Involucrum* or Sheath, in which Sheath it can move with Freedom. See §. 19.

These Ducts (§. 4.) beginning at the outward Surface by a narrow Hole, grow gradually wider, and run either strait, oblique, upward or downward. But what is most surprizing is, that these Ducts never run into one another, nor communicate; but each of them continues separate for every single Worm. Over the Worm's Head there are found two or three Drops of a salt Liquor, thicker than Water, but not the least Appearance of the Dust of the corroded Wood.

§. 6. Whence it appears, that all the Wood, which had before filled up the Place of the Duct, in which the Worm with it's Covering is now found, was eaten and consumed by the Worm: And as it seems quite incredible, that an Animal, which appears soft, and almost as fluid as the White of an Egg, should be able to eat through such hard Wood; I offer the Description of this *Xylophagous Worm* to the Royal Society, in order to give them some Knowledge of this Water-Insect, which has done so many Millions Damage to these Countries.

§. 7. They are found of various Sizes and Thickness. There are some of the younger ones not above an Inch or 2 in Length; some of a middle Size, such as we have represented in *Fig. 12.* and *13.* and some 13 or 14 Inches long.

§. 8. The Head is of a most wonderful Structure, being covered with two hard . . . (I know not which to call them, Shells or *Hemicrania*) of a Substance neither testaceous nor osseous, securing their softer Contents: And being viewed through a Microscope, they appear as in *Fig. 14.* as well as I could have them drawn.

§. 9. These *Hemicrania* are two white Bodies, much harder than the Substance which forms the testaceous Covering; the inner Surface hollow and smooth; the outer, convex and rough, with 3 Fibres running different ways; and both together perfectly represent a double Bit, of that Kind of Borer, we call an Augur.

§. 10. The upper Part of the external convex Surface (*Fig. 14. A.*) has a very sharp Edge, in which the first Series of Fibres begins from one Point; which Fibres gradually dilating, and running lengthwise, end about the middle Part of it; and this middle Part makes a right Angle with the upper Part. In this Part the Fibres being elevated, run cross-wise. (*Fig. 14. B.*) The lower Part is thicker than the upper, but softer and less compact. In this Part the Fibres are raised up and rough, first curve, then strait, and, like the others, run lengthwise to the lower Edge of this Part, which is strongly fastened to the Head by various Ligaments. (*Fig. 14. C, D.*)

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§. 11. The concave or inner Part of these *Hemicrania*, (§. 9.) which contains the softer Parts of the Head, is very smooth; but almost in the Middle has a very small and tender Eminence or Process, (in Shape much like Dr *Rau's* Process in the Organ of Hearing) fixed at one End, and loose at the other, running almost the whole Width, and doubtless destined for supporting some of the inward Parts of the Head. (See *Fig. 15. A.*)

§. 12. These 2 *Hemicrania*, connected together by strong Ligaments, and as it were by a small Hinge, (by means whereof they can dilate without separating) besides their defending the soft Head from external Injuries, are the Instruments wherewith the Animal gets it's Food. For whatever way it turns it's Head, the raised and rough Fibres, running either length-wise or cross-wise, always rub off some of the Wood.

§. 13. These *Hemicrania* carefully removed, the contained Parts (*Fig. 17.*) are laid open to View; but they are so soft, and of so wonderful a Structure, that the Eye, though armed with a Microscope, can neither discern their true Make or Use. First, indeed, there appears a Membrane enveloping the whole Head; in the middle and anterior Part, which is not covered by the said *Hemicrania*, it appears as if raised by a *Tubercle*, (*Fig. 17. c.*) and in that Place it is of a red Colour; but the lower ligamentous Edge firmly adheres both to the small Process (§. 11.) and to the lower Edge of the *Hemicranium*.

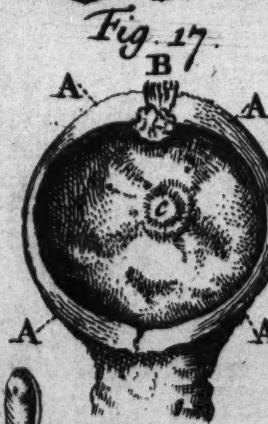
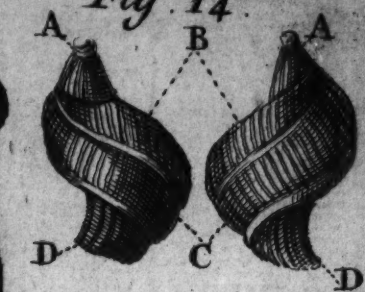
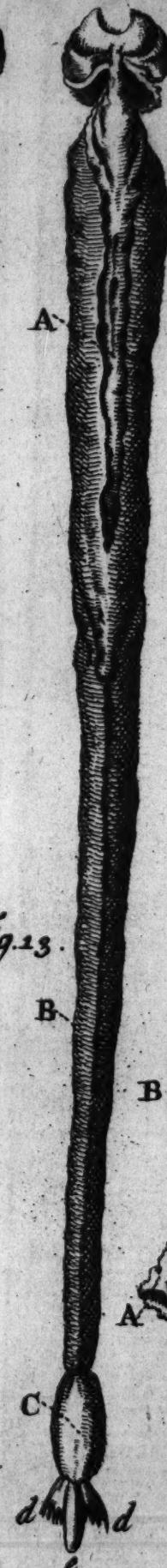
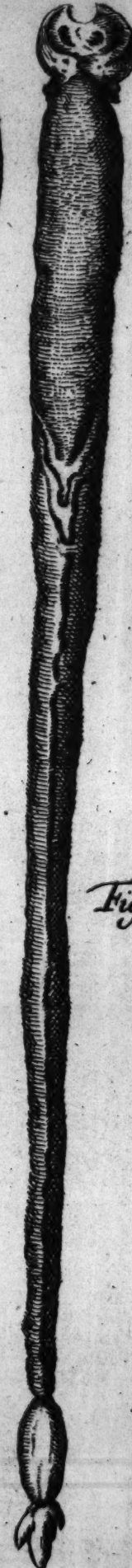
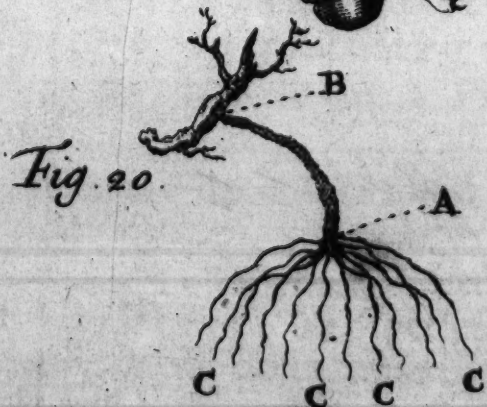
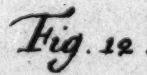
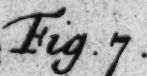
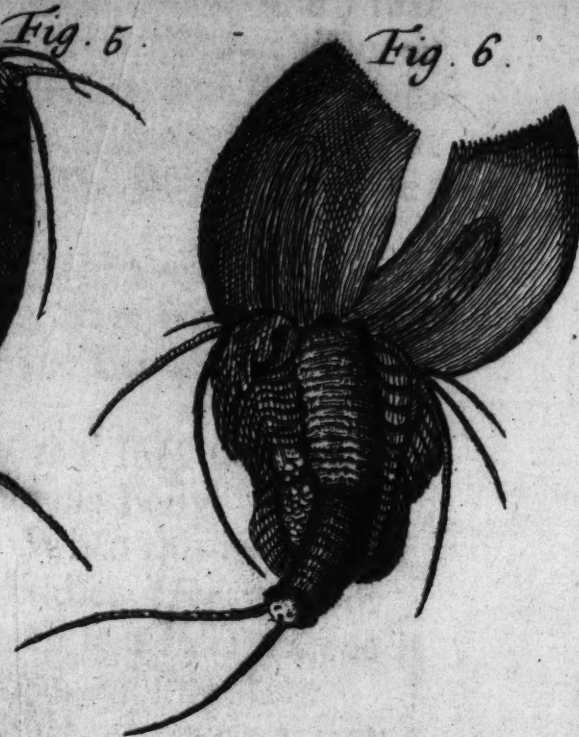
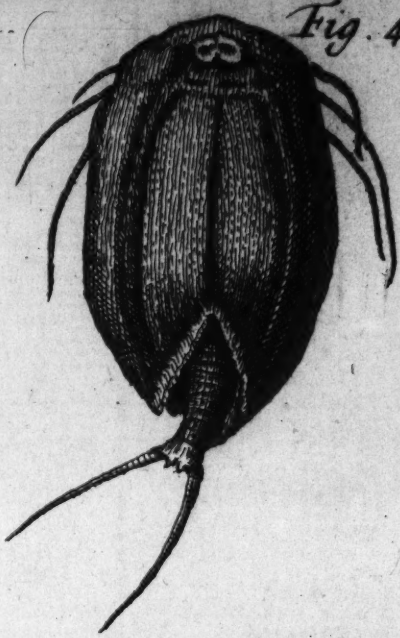
§. 14. This Membrane carefully separated and removed, (*Fig. 18. A. A.*) in the middle of the subjacent Pulp you will find a small Pear-like Body, perfectly pellucid, somewhat protuberant above the other Parts, which made the *Tubercle* in the Membrane (§. 12). It is much harder than the other contained Parts of the Head and Body; so that it will bear cutting with the Scalpel. It is of a red Colour, as perfectly pellucid as a Drop of Water; of the Shape of a Pear, from a larger Basis terminating in a Point. I cannot better resemble it to any thing than to the Crystalline Lens of the Eye: Yet in Spirit of Wine it preserved it's Transparency, but it's Bulk was diminished. (*Fig. 18, B.*)

I cannot guess it's Use: It does not seem to me, as it does to some, to be the Organ of Sight; for the Worm seems to have no Occasion for an Eye, as spending it's Life in perfect Darkness; besides that, the investing Membrane is not transparent, and therefore would obstruct the Sight.

§. 15. At the Sides, where the lower Edges of the *Hemicrania* do not touch one another, there is a Sort of Cavity; and in these Sides the harder Fibres may be distinguished, disposed in such a Manner, as perfectly to resemble the Gills of Fish; and through them the Worm seems to breathe.

§. 16. The extreme Softness of the other Parts of the Head, prevents our coming at the Knowledge of the Use of the Membranes, furnished with *Fibres* of different Tendencies, or enquiring by what Organs the
Worm

SCOLOPENDRA Aquatica Scutata. Pl. II. Vol. IX. part 3. page 26.



Worm takes the Wood shaved off by the *Hemicrania*, or rough Shells; whether it does this by Suction, or not; by what Muscles, or how acting, this wonderful Head is moved. 'Tis probable, indeed, that it's Motion consists in the opening and closing these Shells (§. 8.) that shave off the Wood; and that the inner Parts have a Power to move on all Sides, as the Ball does in the Socket of the Eye; and perhaps to come forth of these Shells, and re-enter after taking their Food. But of these things there can be no Certainty, because the Parts dissolve between the Fingers.

§. 17. The Body, viewed forward, (*Fig. 13.*) is of a reddish Colour. In the middle appears a Line, often dark-brown, often blackish, sometimes not visible, sometimes running near half the Length. The rest of the Animal is of a whitish or grey Colour.

1. If you intend to dissect it, and examine the Inside, you must first remove a thin Membrane surrounding the whole Body, which for that Reason may be called the *Cutis* or *Cuticula*. When this is removed, there appears an oblong Vessel placed in the Middle, (*Fig. 13.*) of a reddish Colour, from the shaved Wood, of which it is full: Hence it seems to be the Stomach, or at least the first Organ of Digestion.

2. In the lower Part you will find another Vessel, appearing like a dark-brown Line, which contains the Excrements, of which it is often found full, and discharges them at the End of the Tail.

3. At the Sides of the reddish Vessel or Stomach (§. 17. 1.) is placed a white, clammy, fat Substance, sticking to the Fingers, and perhaps constituting the Flesh of the Animal.

§. 18. Where the Body ends, the Tail begins, thicker than the Body, and rendered stronger by circular *Fibres*. At it's End, it has 2 small hard Bodies, containing and defending the tender Extremities of the Tail.

This Tail, thicker than the Body, terminates in 2 Ends, the thickest of which certainly serves for the Discharge of the Excrements, the slenderest doubtless for Generation: And this it can stretch out to an incredible Length, so that in Worms that seemed to be in Copulation, it appeared above an Inch out of the Pile.

The two small Bodies, that contain these Ends of the Tail, are of a harder Substance than even the *Hemicrania*. The outer Part is gibbous, the inner hollowed. The lower End is bifid; whence I conjecture, that they serve the Animal for Feet, when it is mounting upright, or corroding the Wood; by leaning on them as on a Prop (*Fig. 19.*).

§. 19. The above-described Worm dwells now very securely in a testaceous Tube of a white Colour, which it exactly fills, yet so as to be able to move with Freedom. That Tube, like the Coverings of Snails, &c. daily grows with the Animal, from the Matter which perspires from it's Body; whence it is sometimes found strait, sometimes bent, according to the Course which the Worm steered in corroding.

§. 20.

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§. 20. As to their Generation, it is probable enough, that, analogous to that of other Insects, it is performed by Copulation of Male and Female: For they can so lengthen one End of their Tail, and thrust it out of the Pile, that they may copulate by that Means. Then they lay their Eggs in the Water close to the Piles, to which they stick by their clammy viscid Matter, (such, for Example, as Frog's Spawn) and afterwards, by the Heat of the Sun, hatch the Worm, which immediately endeavours to get into the Pile. (See §. 2, and 3.)

I could not observe the Difference of Sex, either with my Eye, or a Microscope. Some think them Hermaphrodites, as Snails, and that they copulate in the same Manner: But these Conjectures are not very probable.

§. 21. Many Remedies and Secrets for destroying these dangerous Enemies were immediately boasted of, which for the most Part were Preparations of *Arsenic* or *Mercury*, and are not worth enumerating: I will only give the Receipt of one, which is the best and surest of all.

Take an Iron Plate of an oblong Figure, and of the Width of the Pile, with a strong Handle at each End. One End of this Plate must be armed with thick Nails half an Inch long, and about an Inch asunder. The Nails of this Plate must be driven into a Pile of any slight Wood, with a Hammer, and then the Plate pulled off by Means of it's Handles. And this is to be so often repeated, until the Pile is perforated every where with small Holes: Then it must be dawbed over with *Varnish* in the hottest Sun (the *Varnish* is imbibed by the soft Wood with so many Holes in it); and while the *Varnish* is yet hot, let it be strewed over with *Brick-dust*: And this is to be repeated 3 or 4 times, after the preceding *Varnish* is thorough dry, till the Pile is entirely surrounded with a stony Crust, which will be impenetrable to all Insects, and last many Years.

But the Divine Clemency has already so far destroyed these pernicious Insects, which multiplied so prodigiously for 8 or 9 Years past, that there is great Room for Hope, that our Country will in a short Time be entirely freed from them.

An Explanation of the Figures.

Fig. 12. The Pile-worm of it's natural Size, lying on it's Belly.

Fig. 13. The same lying on it's Back.

See §. 17. A. The Stomach. B. The Duct full of Excrements. C. The Tail, with it's Defences *dd*, and it's Point *e*, which it can stretch out.

The Six following Figures are represented much larger than Life.

§. 10. Fig. 14. *AA*. The first Series of Fibres running strait down. *BB*. The second Series running transversely. *CC*. The third taking a different Course. *DD*. The lower Edge, which is infixed to the Head.

§. 11. Fig. 15. The Shell or *Hemicranium* seen on the Inside with the Process running cross it, one End of which *A* is fixed, the other *a* is movable.

§. 12. Fig. 16. *A. B. C. D.* The same as in Fig. 3. *E*. The Hinge, whereby these are connected, and may easily dilate or open.

§. 13. Fig. 17. *AA*. The Membrane covering the Head freed from the *Hemicrania*, which were attached to this Membrane. *B*. The Place where the *Hemicrania* were connected. *c*. The middle anterior Part, in which the *Tubercle* was prominent.

§. 14. Fig. 18. *AA*. The Membrane of Fig. 17. separated and turned back. *B*. The pellucid pyriform Body lying in the middle of the Head, and which formed *c*. the *Tubercle*.

§. 18. Fig. 19. The two Defences of the Tail, of which the exterior Part *A*. is gibbous; the other, or interior *B*. is, as it were, hollowed: These Extremities are bifid. *C*. By this Part they are joined to the Tail.

VIII. 1. The first Account given to the *Royal Society*, of this surprising Property of an Insect, was in a Letter from M. *Buffon*, of the *Royal Academy of Sciences* at *Paris*, and F. R. S. to *Martin Folkes*, Esq; now President; his Letter bears Date the 18th of July 1741, N.S. and was communicated to the Society at their next Meeting on the 29th of October following; and therein M. *Buffon* acquaints Mr *Folkes* of 2 very singular Observations, lately made in Natural History; the first of a small Sort of Bug, which produces it's Like somewhat after the Manner of Plants, and without Copulation; the other of a small Insect called a *Polypus*, which is found sticking to the common *Duckweed*, and which, being cut in two, puts out from the upper Part a Tail, and from the lower a Head, so as to become 2 Animals instead of one; besides which, when cut in three, the middlemost Part puts out from one End a Head, and from the other a Tail, so as to become 3 Animals, all living like the first, and performing the Offices of their Specie. Both which Observations M. *Buffon* says were well averred.

Of the Polypus, a Water Insect, which being cut into several Pieces, becomes so many perfect Animals. No. 466. p. 219. Nov. 1742.

Mr *Folkes* also at the same time, communicated another Letter he had received from the Honourable *Charles Bentinck*, Esq; at the *Hague*, dated the 15th of the foregoing *September*, wherein it is said, That a young Gentleman of *Geneva*, then in *Holland*, whose Name we since learn to be *Monsieur du Tremblay*, had found in Water, wherein he was looking for Insects, some small things he at first took for Plants, till, on a further Examination, he perceived them to move, and to contract themselves on their being touched; nor could he at first think them to be Animals, by reason of several young Shoots he found to come out from them, and to hang upon one another as far as the fourth Generation: He was, however, at last satisfied they were Insects, and that they preyed upon others, and would even eat raw Flesh. They fixed themselves, he said, by one End to some Plant, or the Side of the Vessel in which they were contained, and at the other End had 6 or 8 Arms, with which they seized their Prey. He also found, that one of them being cut asunder, a few Days after, new Arms were grown out of that Part that had none before; since which he had cut them every Way possible, in Length, Breadth, and obliquely; and always with the same Success; after which he has gone on still further, subdividing them, but never found them to propagate any other ways than by Shoots, several at a Time, and without any Copulation. Mr *Bentinck* added, That this Gentleman would soon print an Account of the Observations he had made; and that the Insects he had himself seen of this Sort, were from about a Line to half an Inch in Length.

The late Mr *Lewenboeck* seems to have met with this same Sort of *Animalcula*, in the Year 1703, and has described and given a Draught of them, in a Letter published in N^o. 283; Soon after which, a more perfect Draught and Description of the same Insects were inserted from an anonymous Hand in N^o. 288, all which Figures answer very well to the Description, and a rough Sketch in Mr *Bentinck's* Letter. In *Fig. 3*, and *4*, of this last cited *Transaction*, one of the Insects is represented as quite pursed up or contracted; but neither Mr *Lewenboeck*, nor the last-mentioned anonymous Author, ever thought of dividing the Insect, though the latter had observed the young Shoot dropping off from the Parent.

Of the same
by J. F. Gro-
novius, M. D.
at Leyden.
No. 466, p.
218.
Read, Nov.
18, 1742.

2. It is now about Nine Months since, that a young Gentleman, living in the Family of *Mynbeer Bentinck* at the *Hague*, discovered a Water Insect, not known yet or described by any Author. It has a pellucid Body, having here and there branched out something like Claws, with which it catches a particular Sort of small Worms, which are every-where found in standing Waters: These are it's Food.

But of what Sort this Insect is, is not known; nor have it's Mouth, Stomach, or Intestines been yet discovered.

But what is most surprising is, that, cut this Animal in 5 or 6 Pieces, in a few Hours there will be as many like their Parent.

This Discovery was and is very surprizing to all our Virtuoso's, and really not believed, until the Professors *Albinus* and *Mussenbrock* were provided with the Animals, and, after having well examined this Creature, found the Prodigy of increasing itself in that wonderful Manner, very true.

One of the Gentlemen that made this Discovery was Mr *Allemand*, a Man of great Learning and Ingenuity, Tutor to the Sons of Mr *s'Gravenfande*.

There have been several of these wonderful Creatures sent to *Paris*, to M. *Reaumur*, from whom we hope for a particular Dissertation.

But after all, I do not think it a perfect Animal, but a kind of the *Uve marinae*, *Holothuria*, or *Zoophyta*, which really are living when they are first caught; of this Kind are the *Pennæ marinæ*, figured by *Barrelierus*, Tab. 1273 and 1774, and also the *Fungi Marini*, Tab. 1293, 1294. These last I remember I have found several times on our Sea-Coasts, and observed that there was a living Nature in them.

3. The last News from *Paris* gives something very surprizing in the Account of M. *Reaumur*'s late Memoir, read in the *Royal Academy of Sciences* there, concerning an Animal called a *Polypus*, in which Life is said to be preserved, after it has been cut into several Pieces; so that one Animal seems by Section to be immediately divided into 2, 3, or more complete Animals, each separately enjoying Life, and continuing to perform the proper Offices of it's Species.

By ———
of Cambridge.
Ibid. p. 227.
Read. Nov.
25, 1742.

Such an Account would have been less regarded, had we not been informed before, that Two * Letters had been communicated to the *Royal Society*, some Months since, from good Hands, both which mentioned the same thing, and related it as a Fact averred, and carefully examined, by one of the greatest Judges, and most indefatigable Promoters, of Natural History, and especially of that Part of it, which leads to the Knowledge of what is most particular and remarkable in the Insect, and Reptile Part of the Creation.

Some of our Friends, who are firmly attached to the general Metaphysical Notions we have formerly learned, reason strongly against the very Possibility of such a Fact: but as I have myself formerly owned, on other Occasions, my Distrust of the Truth, or Certainty at least, of some of those Principles, which I never yet had a sufficient Understanding of, to give a full and clear Assent to; I shall now make no Scruple of acknowledging, that I have already seen so many strange things in Nature, that I am become very diffident of all general Assertions, and very cautious in affirming, what may, or may not possibly be.

The most common Operations both of the Animal and Vegetable World are all in themselves astonishing, and nothing but daily Experience, and constant Observation, makes us see, without Amazement,

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* See the preceding Articles.

an Animal bring forth another of the same Kind; or a Tree blossom, and bear Leaves and Fruit.

The same Observation, and daily Experience, make it also familiar to us, that besides the first Way of propagating Vegetables from their respective Fruit and Seed, they are also propagated from Cuttings; and every one knows, that a Twig of a *Willow*, particularly, cut off and only stuck into the Ground, does presently take Root and grow, and becomes as much a real and perfect Tree, as the original one from which it was first taken,

Here is then, in the Vegetable Kingdom, the very thing quite common, that M. *Reaumur's* Memoir is said to give a rare Example of in the Animal. The best Philosophers have long observed very strong Analogies between these two Classes of Beings: and the Moderns, as they have penetrated further into Nature, have every Day found Reason to extend that Analogy: some have even with great Probability talked of a Scale of Nature in which she, by an insensible Transition, passed from the most perfect of Animals, not only to the most imperfect, and thence to the most imperfect of Vegetables, but even through Coral-line Bodies, and Minerals, to the very Earths and Stones, which seem the most inanimate Parts of our Globe.

Now in such a Scale, who is the Man that will be bold to say, Just here Animal Life entirely ends, and here Vegetable Life begins? Or, Just thus far, and no further, one sort of Operations goes, and just here another sort quite different takes it's Place? Or, again, Who will venture to say, Life in every Animal is a Thing absolutely different from that which we dignify by the same Name in every Vegetable? And might not a Man even be excused, if he should modestly doubt, whether Plants and Vegetables may not themselves be considered as a very low and imperfect Tribe of Animals; as Animals might in like manner, be considered as a more perfect and exalted kind of Vegetables?

We see the two Sexes of Male and Female run through all the higher Parts of the Animal Creation; yet would he have gone a great deal too far, who should have thence asserted, there were no Exceptions to this general Oeconomy; or that this was one of the general and distinguishing Affections of all the Animal Kind: For modern Discoveries have informed us, that there is somewhat very analogous to this in the Vegetable Creation also: And even in the Animal it has been found, that *Snails*, *Earth-worms*, and some others, are really Hermaphrodites, having in themselves the Organs of both Sexes; whilst the working *Bee* is truly of no Sex at all, nor any-ways employed in the Production of that Species, it labours so hard daily to provide with Food.

But, whereas, in Animals, the Division of the Sexes is almost general; and the Union of them in one Subject appears but in a few Instances; contrarywise, in Vegetables, almost all have the whole
Apparatus

Apparatus of Generation in each Individual, whilst only a few Sorts seem to emulate Animals in what is analogous to the Division of them.

I seem, perhaps, to wander too much from the Point first-mentioned; but as I am only offering loose Hints, and such wild Conjectures as come in my Way, hope to be excused, though I yet hazard another Observation, which is, That what appears chiefly to be new, in the Subject of this Memoir, is, that the Animal or Animals live and do well after their Separation, and that they are capable of re-producing such Parts as the Head and the Tail, which seemed essentially wanting.

I say, that the Animal's living and doing well again, is what is chiefly new; for that an Animal, after Separation of some of the principal Parts, seems for some time to retain Life in each Part, must have been observed by every body; and though People generally say, from their Prejudice in favour of some of the Principles above hinted at, that to be sure only one of the Parts, though they know not always which *feels* and has the Sensation of Pain; yet have all I have ever talked with on the Subject, as freely acknowledged, that the *Phænomena* appeared on the other Side.

A *Chicken*, or a *Pigeon*, whose Head is suddenly struck off, shews in both Parts, if no preconceived Opinion led us to think otherwise, strong Signs of Pain and Suffering, and the very same Signs, that the respective Parts of the Animal shew of that Sensation, whilst it is surely living and entire: And I have been told by some, who have seen the Heads of Malefactors suddenly severed from their Bodies, that the same Observation holds also in our own Species. But we have all seen it hold much stronger in the more imperfect Animals, as they are commonly called, such as *Worms*, where, on the Separation of the Body into two Parts, Life has continued seemingly in both, and with strong Signs of it, longer than we have had the Patience to attend and examine. We have been, indeed, quite uncertain, in which of the Parts this seeming Life has been most conspicuous: and as both Parts have seemed to endeavour to get away, and have frequently soon after been found missing, Boys and ordinary People are generally possessed of an Opinion, that they unite and grow together again after their Separation.

Now, if it could once be allowed, that Animal Life and Sensation might subsist but an Instant, in both Parts of the Creature, after it's Section; the whole remaining Difficulty would be only as to the Cure of the Wounds, and the Reproduction of the necessary Organs that are wanting. And, for the first of these, we know very well, that the more imperfect Animals are killed with much greater Difficulty than the more perfect, their Vitals being more diffused, and their general Organization being, I suppose, far more simple than that of the higher Tribes: And as to the other, I think no one will see any Impossibility in the Reproduction of certain Parts, after what we have seen and read

read of, in the *Lobster* and *Cray-fish* Kinds, who when they chance by any Misfortune to loose a Claw, reproduce it in a short time, with all it's Joints, and the proper Muscles for moving them; all which appears as difficult as the regaining of a Mouth and a Tail to some of the *Worm-kind*; whose general Organization being simple, and consisting chiefly of only one strait Gut, or Passage, from the Mouth to the Vent, they seem to want little more to reproduce either, than a Contraction of the Wound, with the Assistance of the Muscles that move the several Rings of which the Body is composed; and every one of which, in it's first and natural State, performs almost the same Motions as are necessary for Suction or Ejection: the latter of which we have even sometimes seen very wonderfully supplied in our own Species, in those Cases, where grievous Wounds of the Intestines have put Nature upon trying to perform her Operations in a new Way.

I shall add one or two Facts I should indeed have mentioned before, when I was speaking of the Difficulty of killing some of the Tribes of Insects and Reptiles; which are, that I have myself seen the Heart of a *Viper* continue it's regular Beats more than 6 Hours after it had been taken out of the Body: That I have seen that Body move and seem alive to all Purposes for a great Part of the same time, after having lost the Heart; and that I have seen *Wasps* whose Heads had been taken off, creeping in the window the next Day; and *Butterflies* that have lived, and attempted even to fly, several Days after undergoing the same severe Operation.

Insects seem at first to suffer but little from the Loss of their hinder Parts, although these contain most of their *Viscera*; nor does the Loss of Limbs seem to affect them in any Proportion to the more perfect Animals. But even in our own Kind, in Infancy, before the Parts have lost all their Softness, much greater Wounds may be received without Loss of Life, than afterwards. If we go yet further back to our *Embryo* State, it is very probable, that yet vastly greater Hurts are recoverable: And it is upon that Principle chiefly, that the best and most likely Account has been given by modern Writers in Anatomy, of some very remarkable Monsters that have appeared in the World, where even some of the most essential Parts of Two *Fœtus's* have been seen wonderfully united in one and the same Body.

By the Hon.
W. Bentinck,
Esq; F. R. S.
No. 467. p. 2.
Jan. 1742-3.

4. What I here send you inclosed will, I hope, answer the Queries of your last Letter. M. Tremblay, the Gentleman who has made the Observations on the Insects, has drawn the following Extract from his Journal: And I can answer for the Truth of the Facts therein contained, as there is not one of them but what I have seen repeated above 20 times.

By Monsieur
Tremblay, at
the Hague.
Translated
from the

5. The Animal in question is an aquatick Insect, which is represented in *Fig. 20.* It's Body *AB*, which is pretty slender, has on it's anterior Extremity *A* several Horns *AC*, which serve it instead of Legs and Arms, and which are yet slenderer than the Body. The Mouth

Mouth of the *Polypus* is in that anterior Extremity; it opens into the Stomach, which takes up the whole Length of the Body *AB*. This whole Body forms but one Pipe; a Sort of a Gut which can be opened at both Ends. French by
P. H. Z.
F. R. S. Ibid.
p. 3.

The Length of the Body varies according to it's different Species, and according to many other Circumstances, to be mentioned hereafter. Fig. 20.

I know 2 Species, of which I have seen some Individuals extend their Bodies to the Length of an Inch and a half; but this is uncommon. Few are generally found above 9 or 10 Lines long; and even these are of the larger Kind.

The Body of the *Polypus* can contract itself, so as not to be above a Line, or thereabouts, in Length. Both in contracting and extending itself, it can stop at any Degree imaginable, between that of the greatest Extension, and of the greatest Contraction.

The Length of the Arms of the *Polypus* differs also according to the several Species: Those of one of the Species that I know, can be extended to the Length of 7 Inches at least. The Number of Legs or Arms is not always the same in the same Species. One seldom sees in a *Polypus*, come to it's full Growth, fewer than 6. The same may be said of the Extension, and of the Contraction of the Arms, which I have said concerning the Body. The Body and the Arms admit of Inflexion in all their Parts, and that in all manner of Ways. From the different Degrees of Extension, Contraction, and Inflexion, which the Body and the Arms of the *Polypus* admit of, results a great Variety of Figures, which they can form themselves into.

These Insects do not swim, they crawl upon all the Bodies they meet with in the Water, upon the Ground, upon Plants, upon Pieces Wood, &c. Their most common Position is, to fix themselves by their posterior End *B* to something, and so stretch their Body and Arms forwards into the Water. They make use of their progressive Motion, to place themselves conveniently, so as to catch their Prey. They are voracious Animals: their Arms extended into the Water, are so many Snares which they set for Numbers of small Insects that are swimming there. As soon as any of them touches one of the Arms, it is caught.

The *Polypus* being seized of a Prey, conveys it to his Mouth, by contracting or bending his Arm. If the Prey be strong enough to make Resistance, he makes use of several Arms. A *Polypus* can master a Worm twice or thrice as long as himself. He seizes it, he draws it to his Mouth, and, what is more, swallows it whole. If the Worm comes end-ways to the Mouth, he swallows it by that End; if not, he makes it enter double into his Stomach, and the Skin of the *Polypus* gives way. The Size of the Stomach extends itself so as to take in a much larger Bulk than that of the *Polypus* itself, before it swallowed that Worm. The Worm is forced to make several Windings and Folds in the Stomach, but does not keep there long alive; the *Polypus* sucks it,

it, and after having drawn from it what serves for his Nourishment, he voids the Remainder by his Mouth, and these are his Excrements. According as the Weather is more or less hot, the *Polypus* eats more or less, oftener or less often.

They grow in Proportion to what they eat; they can bear to be whole Months without eating, but then they waste in Proportion to their Fasting.

There is not on the Body of a *Polypus* any distinguished Place, by which they bring forth their young. I have some of them that have greatly multiplied under my Eyes, and of which I might almost say, that they have produced young ones, from all the exterior Parts of their Body. A *Polypus* does not always put forth a single young one at a time; it is a common thing to find those which produce 5 or 6: I have kept some which have put forth 9 or 10 at the same time, and when one dropt off, another came in it's Place. These Insects seems so many Stems from which issue many Branches. I have learned by a continual Attention to two Species of them, that all the Individuals of these Species produce young ones.

I have for two Years had under my Eye thousands of them; and though I have observed them constantly, and with Attention, I never observed any thing like Copulation. Upon Supposition that this Copulation is performed in some secret Manner: I tried at first to be sure it had not Place between two of them, after they were severed from the Body of their Parent. To this end, I took young ones, the Moment they came from the Parent, which was alone in a Glass; or I even parted them with Scissars: Each of these young ones I put into perfect Solitude, I fed them every one separately in a Glass; they all multiplied, not only themselves, but also their Offsprings, which from Generation to Generation, as far as the seventh, were all confined to Solitude with the same Precaution. Another Fact, which I have observed, has proved to me, that they have the Faculty of multiplying, before they are severed from their Parent. I have seen a *Polypus*, still adhering, bring forth young ones; and those young ones themselves have also brought forth others. Upon Supposition, that perhaps there was some Copulation between the Parent and young ones, whilst they were yet united; or between the young ones coming from the Body of the same Parent; I made divers Experiments, to be sure of the Fact; but not one of those Experiments ever led me to any thing that could give the Idea of a Copulation. The *Polypus* multiplies more or less, as he is more or less fed, and as the Weather is more or less warm. If Plenty of Food, and a sufficient Degree of Warmth concur, they multiply prodigiously.

If the Body of a *Polypus* is cut into two Parts transversely, each of those Parts becomes a complete *Polypus*. On the very Day of the Operation, the first Part, or anterior End of the *Polypus*, that is, the Head, the Mouth, and the Arms; this Part I say, lengthens itself, it creeps,

creeps, and eats. The second Part, which has no Head, gets one ; a Mouth forms itself, at the anterior End ; and shoots forth Arms. This Reproduction comes about more or less quickly, according as the Weather is more or less warm. In Summer, I have seen Arms begin to sprout out 24 Hours after the Operation, and the new Head perfected in every respect in a few Days. Each of those Parts, thus become a perfect *Polypus*, performs absolutely all it's Functions. It creeps, it eats, it grows, and it multiplies ; and all that, as much as a *Polypus* which never had been cut.

In whatever Place the Body of a *Polypus* is cut, whether in the Middle, or more or less near the Head, or the posterior Part, the Experiment has always the same Success.

If a *Polypus* is cut transversely, at the same Moment, into three or four Parts, they all equally become so many complete ones.

The Animal is too small to be cut at the same time into a great Number of Parts ; I therefore did it successively. I first cut a *Polypus* into four Parts, and let them grow ; next, I cut those Quarters again ; and at this Rate I proceeded, till I had made 50 out of one single one : And here I stopped, for there would have been no End of the Experiment.

I have now actually by me several Parts of the same *Polypus*, cut into Pieces above a Year ago ; since which time they have produced a great Number of young ones.

A *Polypus* may also be cut in two, lengthways. Beginning by the Head, one first splits the said Head, and afterwards the Stomach : The *Polypus* being in the Form of a Pipe, each Half of what is thus cut lengthways forms a Half-pipe ; the anterior Extremity of which is terminated by the half of the Head, the half of the Mouth, and Part of the Arms. It is not long before the two Edges of those Half-pipes close after the Operation : They generally begin at the posterior Part, and close up by Degrees to the anterior Part. Then each Half-pipe becomes a whole one complete : A Stomach is formed, in which nothing is wanting ; and out of each half Mouth a whole one is formed also. I have seen all this done in less than an Hour ; and that the *Polypus*, produced from each of those Halves, at the End of that Time did not differ from the whole ones, except that it had fewer Arms ; but in a few Days more grew out.

I have cut a *Polypus* lengthways, between 7 and 8 in the Morning ; and between 2 and 3 in the Afternoon, each of the Parts has been able to eat a Worm as long as itself.

If a *Polypus* is cut lengthways beginning at the Head, and the Section is not carried quite through ; the Result is, a *Polypus* with two Bodies, two Heads, and one Tail. Some of those Bodies and Heads may again be cut lengthways soon after. In this Manner I have produced a *Polypus* that had seven Bodies, as many Heads, and one Tail. I afterwards, at once, cut off the seven Heads of this new *Hydra* :

Of the Polypus, a Water Insect.

Seven others grew again ; and the Heads that were cut off became each a complete *Polypus*.

I cut a *Polypus* transversely into two Parts: I put these two Parts close to each other again, and they re-united where they had been cut. The *Polypus*, thus re-united, eat the Day after it had undergone this Operation : It is since grown, and has multiplied.

I took the posterior Part of one *Polypus*, and the anterior of another, and I have brought them to re-unite in the same Manner as the foregoing : Next Day, the *Polypus*, that resulted, eat : It has continued well these two Months, since the Operation : It is grown, and has put forth young ones, from each of the Parts of which it was formed. The two foregoing Experiments do not always succeed ; it often happens, that the two Parts will not join again.

In order to comprehend the Experiment I am now going to speak of, one should recollect, that the whole Body of a *Polypus* forms only one Pipe, a Sort of Gut, or Pouch. I have been able to turn that Pouch, that Body of the *Polypus*, inside-outwards ; as one may turn a Stocking I have several by me, that have remained turned in this Manner ; their Inside is become their Outside, and their Outside their Inside : They eat, they grow, and they multiply, as if they had never been turned.

They are to be looked for in such Ditches whose Water is stocked with small Insects. Pieces of Wood, Leaves, aquatic Plants, in short, every thing is to be taken out of the Water, that is met with at the Bottom, or on the Surface of the Water, on the Edges, and in the middle of the Ditches. What is thus taken out, must be put into a Glass of clear Water, and these Insects, if there are any, will soon discover themselves ; especially if the Glass is let stand a little, without moving it ; for thus the Insects, which contract themselves when they are first taken out, will again extend themselves when they are at Rest, and become thereby so much the more remarkable.

In order to feed them, one must know how to provide one's self with Insects fit for their Food.

*An Abstract
of what is con-
tained in the
Preface to the
Sixth Volume
of M. Reau-
mur's History
of Insects, re-
lating to the a-
bovementioned
Observations,
Ibid. p. 12.*

6. M. *Reaumur* observes, that though in the Histories he has already given of minute Animals in this Work, he has had Occasion to produce many new and unexpected Phænomena : One he has now to mention would exceed all Belief, if it was not confirmed by the strongest repeated Observations ; which is, that there are Species of Insects, who are multiplied by being cut to Pieces, and among which, one single Animal, divided into 8, 10, 20, 30, or 40 Parts, becomes so many entire Animals, each similar to that of which it was at first only a Piece. This Animal, being one of those that undergo no Change in their common Form, does not belong to the Design of this present Volume which treats only of some of those, which, having been first a Worm or Maggot, are then changed into a Chrysalis, and from thence, either into a Fly or Scarabee. Yet M. *Reaumur* observes, the Num-
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ber of Questions that had been put to him concerning this Insect, as well by Persons at home, as by his Correspondents abroad, had made him think he ought not to defer giving now some Satisfaction to the Curiosity of the Publick. Besides that he found himself obliged, to give in this Manner his Attestation to the Truth of this Fact, first observed by Mr *Tremblay*, a Gentleman of *Geneva*, now residing in *Holland*, and confirmed by Numbers of the most curious and accurate Experiments: Which Attestation he also observes, in so strange a Fact, could hardly be expected to have sufficient Weight, should he not say enough to put his Readers in a Condition to observe themselves, and see with their own Eyes, the Truth of the Particulars he relates.

Mr *Tremblay*, about 2 $\frac{1}{2}$ Years since, observing the numerous Insects, with which the Water of a Ditch, covered with Duck-weed, was plentifully stocked, discovered some odd-shaped Bodies, of a greenish Colour, concerning which he was doubtful whether to look on them as Plants or Insects; he thought, by cutting them, to assure himself to which of these Classes they properly belonged; as supposing, if to the former, they would probably not be destroyed by cutting, but vegetate again: They seemed to do so; and upon this, he was inclined to look on them as a Sort of Water Sensitives; till fresh Experiments every Day shewed him new Operations. They discovered a sort of voluntary locomotive Faculty; they seemed to seek the Light; they caught other Insects, and devoured them with great Eagerness. This threw him into fresh Amazement; yet a prudent Diffidence still hindered him from pronouncing positively concerning them; he communicated his Observations, and dispatched some of the Insects themselves to M. *Reaumur*, in Dec. 1740. He, he says, repeated all Mr *Tremblay*'s Experiments, and not only by himself, but with Monsr. *Bernard de Jussieu* of the *Royal Academy of Sciences*, and of this Society, and with several more of the *Academy*. The Experiments succeeded as they had done in *Holland*, and they were all convinced they could not refuse acknowledging the Insects in question, to be really such: however new and surprising their Properties appeared.

M. *Reaumur* then gives a general and very succinct Account of the Experiments tried by Mr *Tremblay* and himself; which agrees with what is contained in the preceding Paper.

These Experiments were no sooner known among the Curious in *France*, but it was presently imagined, these Insects were not the only Species to which Nature had given so extraordinary a Faculty: And numberless Observations were made to that Purpose. M. *Bonnet* was not long before he found a very slender Water-worm, of about an Inch and a half long, that had the same Property; and Monsr. *Lyonnet* discovered another above 3 Inches long, and of the Thickness of the Treble String of a Violin, that being cut into 30 and 40 Parts, afforded the same Phænomena. Monsr. *Reaumur* was desirous, if possible, to see the Success of these Experiments in some Animals of a larger Size;

and inclined to believe some Sea Productions, not very unlike in Shape to these Fresh-water ones, together with other Bodies among those distinguished by the Name of *Urtica Marinae*, and Star-fish, might not improbably be endowed with the like Faculties; he engaged M. Guettard, and M. Jussieu, to be assistant in making Variety of Experiments by the Sea-side, on these several Sorts of Bodies; the first was on the Coasts of *Poitou*, the other on those of *Normandy*; and they were soon sufficiently satisfied, the same Laws of Nature had Place in these Sorts of Animals also. Many of the Star-fish Kind particularly, and which usually consist of five equal *Radii* or Arms, were found wanting, some one, others 2, 3, or 4, of those *Radii*; and Nature was reproducing in them the *Radii* wanting. M. Jussieu broke and cut Star-fish into several Parts; he had the Pleasure to see those several Parts continue alive, and to observe their Wounds to cicatrize and heal, though he could not stay long enough in the Country to see the new Parts break out, in the room of those he had cut away; which has been however, supplied by M. Girard de Villars, who, on the Coasts near *Rockelle*, has seen the *Urticae* reproduce all that had been cut off, and the Parts of the Stars also putting out each new *Radii* in the Room of those he had deprived them of. M. Jussieu also reported, that this Fact in the Star-fish, so new to him, was not so to the common Fishermen of the Country, who seeing him tearing and cutting to Pieces one of those Animals, told him, *Qu'il auroit beau faire, qu'il ne parviendroit pas à leur ôter la vie*: Those poor People having been accustomed to see daily a Fact, the more philosophical Part of Men had never so much as heard of.

M. Reaumur, though very sensible that Water Insects had a considerable Advantage over others for the Recovery of their Wound, was yet willing to try if some Land Insects might not possibly afford also some like Observations; and after several Trials, both he and M. Bonnet, have met with some Sorts of Earth Worms capable of bearing the Operation. M. Reaumur has cut in two some of these Worms; the anterior Part, that to which the Head belonged, seemed to have little suffered: In less than two Days, the *Anus* was formed again, as it had been before, and the Worms were compleat to all Purposes, but that they were shorter, and wanted of their Length: They lengthened, however, by Degrees, the Number of the Rings of which they are composed increased, and they came again to their first Length at the End of some Months. But the posterior Part of the Worms, that to which the Tail belonged, wanted Matters of another Consequence; that Part had lost not a Head only, but the Parts of Generation also of both Sexes; which in those Creatures are placed not very distant from the Head: And to reproduce all these was the Work of some Months; it has, however, in many Instances, been done after that Time; and several of these hinder Parts of Worms have again become complete Worms, having each both a Head, and Male and

Female Parts of Generation, and in as complete a Manner, as the whole Worms had before their Section. Tho' many, indeed, have died during the Operation, before the Reproduction was made complete: Yet, as in various Instances, where proper Care has been taken, the Experiment has succeeded; it is equally to be regarded, as if the making it required neither so long Time, nor so much Care.

7. I received the Insects in Question, on *Thursday* the 10th of this instant *March*, in the Afternoon; the Water in which they were contained was grown foul at Sea, so that I immediately poured some of it off, and supplied it with fresh:

I have found, that most of those I have particularly viewed, and that seem pretty well grown, have 10 Horns or Arms; but I have seen a few with 11 some others with no more than 9, and one I have taken notice of, that had 14: The lesser ones have frequently but 6 of these Arms, and those have the fewest I have yet observed.

The Structure of the Arms, when looked at with the Microscope, is very curious: Each seems to consist of several Rows of Knots or small *Papillæ*, joined together by a transparent Membranous Substance, and which is endued with a most exquisite Power of Extension and Contraction; so as thereby to bring any of those Knots nearer together, or set them further asunder, and that in every possible Direction whereby the Animal is able to bend any of these Arms in any Part, and all sorts of ways: Besides which, these Arms are also capable in the whole of so great an Extension and Contraction, that I have frequently seen some of those of the same Creature extended, at one Moment, to more than 10 times the Length they were of at another.

The Body of the Insect is not much less capable of lengthning and shortning itself than the Arms. When most contracted, it looks like a little Ball, from one Part of which rises a small Knob, not unlike what is commonly seen at the Head of a Lemon: This is the Tail, and upon this the Insect in this Case generally rests: Opposite to this is the Mouth, round which the Arms appear regularly extended, and resemble a little Star, as usually represented, all whose Points seem to proceed from the same Centre. But, when extended, the same *Polypus*, which, in the Position just described, scarce appeared $\frac{1}{10}$ of an Inch in Diameter, has drawn itself out to full $\frac{3}{4}$ of an Inch in Length; in which State the Mouth does, for the most Part, project like a small and sharp Snout in the midst of the Arms.

Together with the Insects, M. *Tremblay* sent me over some very small Water-worms, which he informed me they readily preyed upon; and these Worms I have several times had the Pleasure of seeing them seize with great Dexterity and Eagerness; soon after which they have sucked them in, and swallowed them completely down, though apparently several times larger than themselves.

M. *Tremblay* has given a very exact and curious Description of what concerns their taking and devouring their Prey: To which I shall only add,

Some Account
of the same
Insect by Mar-
tin Folkes
Esq; Pres.
R.S. No. 469.
p. 422. Read
Mar. 24.
1742-3.

add, that it appears to me, that the little *Papillæ* above described on the Surface of the Arms assist them like so many Hooks or Tenters to hold their Worms barely by touching them; for I have more than once seen a *Polypus* draw a Worm to him, and nimbly turn it about with a single Arm, only laid over it, without folding or clasping it; which last Method, however, he makes use of also, when the Worm comes to struggle and strive hard to be disengaged.

Generally before the *Polypus* fixes on the Worm with his Mouth, the Mouth and his whole Fore-part begins to extend itself; and after fastening upon it, which is frequently near the Middle, the whole Body swells, the Worm commonly appears bloody, and the *Polypus* sucks down a great deal of the Blood and Juice, before he begins to swallow the Worm itself: During all this Time he continues to extend and stretch his Mouth, and that to such a Degree, that I have seen it's Breadth, when in the Act of first bending in a Worm seized by the Middle, not less than the whole Length of the Animal when in a mean State of Extension.

In the Situation just mentioned, the Mouth resembles an open Cup; and there is a conspicuous Neck between that and the Belly, which then swells out like that of a *Florence* Flask; beyond which again appears the Tail, not stretched in proportion to the rest, but whose Cavity, when the Insect is made transparent, appears to the Microscope as a Gut running from the Stomach, but which has seemed to be a *Cæcum**, and not open at the lower Extremity; nor have I ever yet seen any thing like an Evacuation that Way.

As the *Polypus* gets the Worm to double, and draws it further in, the Neck, just mentioned, swells, and the Mouth somewhat contracts again, so that the whole Body puts on the Appearance of a sort of Purse or Pouch; but the Tail never entirely disappears, though it shortens remarkably, on the Swelling of the Gut with the Juice drawn from the Worm: But into this Gut I have never seen any of the solid Part of the Worm to penetrate, though I have often seen it's whole Body lie coiled up in what I have looked upon as the Stomach of the Insect.

He lies for the most part pretty still during the latter Part of his Meal, like a Creature gorged with too much Food, drawing in the Worm slowly at last: But after it is all got in, he again contracts his Mouth, and stretches his Neck-part in Length, as it were, to compose the Posture of the Worm in his Stomach, where it continues to lie till digested; it soon loses it's Distinctness, and it's Shape becomes in a little time undiscernable; the *Fæces*, however, are not thrown off till several Hours after, when they come away by the Mouth in the Form of small Pellets of Cobweb, which I have not yet

* This has since appeared to be a Mistake; the Gut is also open at the lower End, and though the larger *Fæces* are all thrown up again by the Mouth, I have since seen a thinner Slime evacuated that Way.

actually seen thrown out, though I have several times seen them before they were thoroughly disengaged from that Part.

A *Polypus*, when in a middling State of Contraction, shews to the Microscope, much like a Slug or long Snail: His Sides are wrinkled, and he then appears as if made up of Rings, like a Grub or Earth-worm; but these Rings all disappear when the Insect is more extended, his whole Skin then looking as beset with little *Papillæ*, like those of his Horns or Arms, except that they are smaller.

When he hangs fixed to any thing by the Tail, his most usual Posture, he will turn his Body in all Ways, coiling and writhing it about, so as sometimes to stroke, as it were, his Tail with his Arms, and rub it with his Mouth, as if to remove some Uneasiness, possibly given him by lesser Water-insects, which I have often observed like Lice crawling upon his Body. A progressive Motion I have also sometimes seen, when he helps himself alternately with his Arms and Tail, but this sort of Motion is less frequent than his others.

These little Particulars, may serve to shew the *Polypus* is really and truly a living Creature, and, like other small Insects, provided with proper Parts and Organs for the catching, eating, and digesting, of his Food: For though the Production of the young ones from the Sides of the Parent has a near Resemblance to the shooting of the Branches from the Trunks of Vegetables, and though some other of his Properties are so very singular and surprising; yet all those above-mentioned and described, are, without all Doubt, Animal Operations.

This Sprouting of the Young Ones from the Sides of the others, is already so fully described by M. *Tremblay*, that I have very little to add to that Description, farther than to observe, that the young ones I have seen shoot out, had no Arms till they had acquired some Length: Those I have had the Beginning of before me, have not shewed them till about the Fifth Day from the first Appearance, but this might probably vary in a warmer Season.

As soon as the little ones have Arms, they will themselves take and eat Worms while fixed; and it appears, that during that Time, the Gut of the little one opens into and joins the Gut of the Parent: This I hope indeed to confirm by some further Experiments; but it has constantly appeared to me, that upon the little ones eating, the Stomach and Gut of the Parent has become extended also, and *vice versa*.

I have had one *Polypus*, that had Three young ones dependent from him at the same time, and one of these young ones has begun to put out a young one itself, so that they formed a Cluster of Five of these Insects hanging together: But one of the young ones separated itself, and dropt off Yesterday Morning; and this Morning I perceive another little one just breaking out.

On Sunday the 13th of this Instant *March*, I chose a long slender *Polypus*, that appeared lively, but that had not been fed since I received it; and putting it with a Drop of Water in the Palm of my Left Hand, I watched

Some Account of the same Insect.

I watched the Time of it's extending itself, and then with my Scissars cut it asunder into Two Parts, near the Middle; both which Parts I put separately into Two Phials of *New-River-Water*. This was done about 2 in the Afternoon.

On *Monday* the 14th, I observed the Arms on the Head-part to play; the Tail-part lay along on the Bottom of the Phial, but looked plump, and from time to time alternately extended and contracted itself: The Wounds of both Parts appeared contracted and drawn together.

On *Tuesday* the 15th, the Head-part seeming active and busy with it's Arms, I gave it, about 9 in the Morning, a small Piece of a Worm; it very readily seized it, and presently after eat it: I viewed this Part carefully with a Magnifying-glass, and found the Wound no-ways affected by the Extension of the Stomach. The Wound of the Tail-piece appeared well rounded off.

On *Wednesday* the 16th, the Head-piece seemed very well. The Tail-piece stirred very remarkably, and it's wounded End shewed in Shape like that of a little turned Nine-Pin.

On *Thursday* the 17th, I saw the Head-piece raised up and resting on it's posterior End, as before it was hurt. The Tail-piece discovered a very remarkable Rounding off at the wounded End, which looked also somewhat extended, and more pellucid than the rest. It both extended and contracted itself very sensibly, moved more frequently than it had yet done, and I observed a small Protrusion towards the Middle of it's Length, which I fancied like the Beginning of a young one just putting out from that Part.

On *Friday* the 18th, about 7 in the Morning, I perceived little Horns or Arms putting out from the wounded End of the Tail-part: They were yet very short, but shewed themselves distinctly all round, and I could see them play very clearly. The Protrusion on the Side was enlarged, so as now to be known evidently for a new *Polpus*. The Head-part seemed very well; and in the Afternoon the Arms of the other Part were sensibly lengthened.

On *Sat.* the 19th, I found the new Arms yet longer: I now gave a Piece of a Worm to this Part. It readily hooked it, and eat it. The little one was very conspicuous, but that it yet wanted Arms.

On *Sunday* the 20th, every thing was improved, and small Arms began to discover themselves, on the little one sprung from the Side of the Tail-piece.

On *Monday* the 21st, both Pieces appeared perfectly well, they had all the Appearance of perfect entire Insects, the same as before they were cut, and continue as fair and as good as any I have. The little one is not yet dropt off.

I have been very particular in this Account, from the Minutes I took down every Day; and I shall further observe, that I cut 3 more transversely in the same Manner, on the same Day, *Sunday* the 13th Instant

Instant, and that I had so cut one on the Day before: They all went on nearly in the same Manner, and all shewed the new Arms on their Tail-parts on the same *Friday* the 18th; but I must also take Notice, that *Thursday* last the 17th was a fine warm Day, to which I impute it, that the Insects cut on *Sunday* were just as forward as that cut on the Day before. One other of the Tail-pieces of these also put forth a young one, during the time that it lay without a Head. All these Four last-mentioned had eat about 36 Hours before they underwent the Operation.

On *Tuesday* the 15th Instant, I took a *Polypus* that had eat a Worm on the *Saturday*, and, placing it as before in the Hollow of my Left Hand, I attempted, when it was most contracted, to divide it longitudinally; but my Scissars not being very good, I missed my Stroke, was forced to give a Second, and even then divided it very unequally; the Head was however split, and of 10 Horns that it had, 6 came off with the lesser Piece that was only a Slip of the Body, and the 4 others remained with the rest, which was at least $\frac{2}{3}$ of that Body. I had very small Expectation from this Experiment, I nevertheless put both the Pieces with some Water into a Phial; and both this Day in the Afternoon and the next, I saw both Parts playing their Arms.

On *Thursday* the 17th, in the Forenoon, perceiving both these Parts to move their Horns pretty briskly, I gave to each a Piece of a Worm: Each readily seized it, eat it, and kept it as usual; and the same Day in the Afternoon, I took Notice, that a little one was putting out from the Side of the larger Piece.

On *Saturday* the 19th, I saw both the Pieces resting on their posterior Ends, and stretching out their Bodies in the usual way.

On *Monday* the 21st, both Parts seemed well, each was like an entire *Polypus*, except that one of them was, and is still, very small. I discovered some little Arms putting out in the room of those each Part had lost: There appeared also little Arms coming out all round the Head of the little one fixed to the Tail of the larger Piece.

On *Tuesday* last the 22d, I viewed both these Pieces with the Microscope, and each seemed perfectly formed like a whole *Polypus*. The larger Piece had 4 new Arms, and the lesser 2, like their others, but shorter, as yet; and they are now in all other respects, as complete as any others I have.

This same Experiment I again attempted on another *Polypus*, on *Saturday* last; but I again made the Parts unequal; they are however both alive, and promise very fairly.

I the same Day cut a fine long *Polypus* into 3 Pieces, transversely, at 5 in the Afternoon. I left the Middle-Piece the longest of the 3.

On *Monday* the 21st, the Head-Piece seemed well formed again, excepting that it was yet very short; the other Pieces looked plump and well. On *Tuesday* the Head-piece eat and kept Part of a Worm: It seized it very vigorously with it's Arms, mastered it, and swallowed it

it eagerly. The Middle-piece moved pretty much, and the last looked fresh and well. This *Thursday* Morning, the Arms begin to shew themselves on the anterior Extremity of the Middle-piece.

Fig. 21. Represents a *Polypus* as seen in the Microscope, when in a State of Extension, the Arms spread as when feeling for their Prey, and the Mouth sharp and prominent.

Fig. 22. and 23. Represent the same Insect in it's most contracted State.

Fig. 24. and 25. Shew the Insect when in a middle State of Contraction; the Body is then wrinkled, so as to appear somewhat like a *Grub* or *Earth-worm*.

Fig. 26. Is a *Polypus* with a young one growing from it's Side, and another from that again: This is not so much extended as that in *Fig. 1.* and is to be supposed to have taken lately some Food, whereby the Cavity of the Inside is made more conspicuous, and the Communication of the Guts of the young ones with those of the Parents becomes sensible.

Fig. 27. Shews the Appearance of a *Polypus*, that has already swallowed the best Part of a Worm endways. He is grasping the remaining Part to draw that in also.

Fig. 28. Represents a *Polypus*, whose Mouth is greatly extended: He has just taken in the middle Part of a Worm; the Opening of the Mouth is there remarkable, the Arms seem somewhat contracted from the Effort in stretching the Mouth so wide; the Neck also may be there observed between the Mouth and the Stomach, but which will soon disappear as the Worm is sucked further in.

Fig. 29. Is another *Polypus*, nearly in the same State as the last; but the Worm is omitted in the *Figure*, to shew the Form of the Mouth more distinctly.

Fig. 30. Shews the same *Polypus* when the Worm is drawn quite double into his Stomach; here the Neck entirely disappears, and the whole is like an open Bag or Purse.

Fig. 31. The same *Polypus*, after he has entirely swallowed his Worm; the Mouth is now again closed and contracted, and the Worm may be discovered through the Skin, as it lies coiled in his Stomach. In these Five last *Figures* it may be noted, that, however extended and swelled the Stomach of the Insect appears, the posterior Part is not stretched in Proportion, but discovers itself every-where as a small Tail, in which is contained a Gut, with which the Stomach communicates.

Fig. 32. Shews one of the Horns or Arms of a *Polypus* very much magnified, for the giving some imperfect Idea of the Knots or *Papillæ* in the transparent membranous Substance, of which it is composed.

Fig. 33. Represents a *Polypus* that had several Young growing from him at once, some of which had also others springing out from them again. This was the same *Polypus* mentioned in the foregoing

P'aper to have had three young ones dependent from him at the same time, but which, becoming still more fruitful, was drawn a few Days after as he appears in this Figure, and when, besides those here represented, Eight other young ones had at several times separated themselves from him, since I received the Insects.

8. I have seen in Mr Tremblay's Study at Sorgoliet at least a Dozen large Glasses of about a Foot high, each holding a Gallon or 6 Quarts of Water, all which are well stocked with those Insects, and he must there have many Hundreds of them. They are, in general, considerably larger than any I had before seen; and as I was first with him on a Tuesday, and made him a second Visit on the Sunday following, I had the Opportunity of seeing the prodigious Increase they had made in those 5 Days. Several single ones that I had left, had in that Time put out 5 or 6 young ones apiece; and those I had seen him perform Operations upon, were not only recovered, but had most of them produced young ones also. I saw him split the Head of one about 2 in the Afternoon on Tuesday, and, at about 7 the same Evening, each Head eat a small Worm. I saw him split another from the Head to the Tail, and each of those Parts also eat Part of a Worm before Night. Another Operation I saw him make, which I had not before heard of, which was that by putting one of the Points of a very small Pair of sharp Scissars into the Mouth of a *Polypus*, and forcing it out at the very End of the Tail, he then laid it quite open like a *Pigeon*, or a *Barbacute Pig* to be broiled; yet, in about 5 Hours, I saw the same *Polypus* with the Parts so reunited again, that I could not perceive any thing had been done to it; and it then eat a large Worm bigger than itself. He then shewed me another odd Particular, which was one *Polypus* that had fairly 2 Heads without any Tail; that is, with a Head at each End, Fig. 34. This was an accidental Production, and the Manner it came about was as follows: Two young ones grew, as from one Root, out of an old *Polypus*, Fig. 35. They both dropt off together, and their Tails not being separated, they appeared as in Fig. 34; but, when I saw them, more like the Fig. 36, with several young ones putting out from their Sides. Mr Tremblay told me, he had seen the like sometimes before, but not often; and that they have then remained 10 or 12 Days in that Condition, after which they have separated. He had in one of his large Glasses upwards of a Hundred of these Insects all full grown, and he regaled them all at once before me, with some Thousands of what he calls *des Pucerons d'Eau*, which are small aquatic *Animalcules*, not unlike Fleas, of about the Size of large ones, and which move about with great Swiftnefs on the Water. These were no sooner put in, but it was really both a curious and entertaining Sight, to observe in how voracious a Manner not only every *Polypus*, but every young one also that had Arms, though fixed to the Side of it's Parent, seized and devoured these *Pucerons*: And as the Body of the *Polypus* is transparent,

By the Duke
of Richmond,
F. R. S. No.
470, p. 510.
Read June 2,
1743.

parent, every one made a very extraordinary Appearance from the Number of *Pucerons* in them; for in several I could very plainly, with my bare Eye, distinguish and count 5 or 6 of them; and, what was very particular, I could plainly discern some very small black Spots, which I was assured were the Eyes of these *Pucerons*. I had almost forgot to mention one extraordinary Observation more of Mr *Tremblay's*, which is, that in the double headed *Polypus* of the Fig. 34 and 36. there was at first but one common Gut between them, so that the feeding of one Head had the same Effect as the feeding them both. Mr *Tremblay* is particularly handy and dextrous in his Operations, and explains himself about them with great Exactness and Perspicuity. He places some Pieces of Packthread cross his Glasses towards the Top: To these some of the Insects fix themselves; and I have seen some that in that Posture have extended their Arms almost to the Bottom, which must have been above 10 Inches.

Some Observations on a Polype dried, by Mr Henry Baker, F.R.S. No. 471. p. 616. Nov. 1743. Read Dec. 8, 1743.

9. Apprehending that if a *Polype* could be dried, and well extended before the Microscope, some Particulars in it's Structure might be distinguished better than when we view it alive, and in Water, I applied myself to attempt the doing it: And, after many Trials (which were rendered fruitless by the Minuteness and extreme Tendereness of the Arms and other Parts of this Animal, that contract as soon as taken out of Water, and so cling together, as to become inseparable afterwards, without being torn to Pieces) I happened, at last, to hit on a Method of performing the Operation perfectly; which Method I shall here subjoin, as taken from my Essay on this Creature lately published *.

The Method of drying Polypes for the Microscope.

I chuse a *Polype* to my Mind, and put it in a small convex Lens with a Drop of Water; where, when it is extended, and the Tail fixed, after pouring off a little of the Water (if the Quantity seems too much) I plunge it, Lens and all, into Spirits of Wine, in the Bowl of a large Silver Spoon. Hereby it is instantly killed; the Arms and Body contracting, sometimes more, sometimes less, at the same Time. I then rub it gently in the Spirits with a very small soft Hair Pencil, to clear away it's Lice, which may be seen to fall off, and lie dead at the Bottom of the Liquor.

Thus far the Business seems pretty easy; but all the Skill I am Master of could never enable me to take a *Polype* out of the Spirits, and extend it's Body and Arms on a Talc, though I have destroyed great Numbers in attempting it; for the Parts immediately cling together, in such a Manner, that it is not possible to separate them again, without tearing them all to Pieces.

I bethought myself, therefore, of adjusting them upon the Talc, whilst in the Spirits; and, to effect this, I slip a Talc under the *Polype's* Body lying in the Spirits; and, displaying it's Arms, &c. there-

* Natural History of the Polype, p. 84.

on with my Pencil, by the Assistance of my Nippers I lift the Talc, and the *Polype* upon it, gently out of the Spirits: Then, holding it in my Nippers with my Left Hand, I dip my Pencil in the Spirits with my Right, and therewith dispose the several Parts to my Wish as near as I am able; at the same Time wiping away the Lice with my Pencil, if any are to be seen upon the Talc.

When all the Parts are rightly extended, I lay it carefully to dry, which it does very speedily, leaving the *Polype* sticking to the Talc in the Manner it was disposed.

The chief Difficulty now is over; but some Caution is still needful to secure it safely in a Slider: For if another Talc be laid upon it in the common Way, all our Labour will be rendered fruitless, by it's being broke and spoiled. To prevent this Misfortune, as soon as the Talc, whereon the *Polype* sticks, is let down into the Hole of a Slider, I cut three little flat Pieces of Cork, about the Bigness of Pins-heads, and the Depth of the *Polype*, and gum them in a triangular Position, partly on the Edges of the said Talc, as it lies in the Hole, and partly to the Ivory Sides of the Hole itself; by which means the upper Talc being kept from being able to press upon the *Polype*, it may be put on and fixed down with a Brass Ring, without any Fear of hurting it.

If you intend to dry a *Polype* in it's contracted State, it may be put directly into the Spirits without using any *Lens*; but if you desire it extended, you will find the *Lens* quite needful.

Vinegar, Water wherein Salt is dissolved, or Spirit of Wine, kills a *Polype* immediately: But Spirit of Wine is fittest for the Purpose, as it gives a greater Firmness to the Parts, dries away from the Talc soonest, and leaves no Soil or Smear behind it, as the others do.

1. As the the Body thus dried exhibits a Reticulation of minute Vessels, which appear every where most curiously interwoven, we may reasonably suppose they serve as Veins and Arteries, through which some Kind of Blood or Juices circulates, as in other Animals: But we cannot distinguish such Blood or Juices circulating in the living *Polype*, or discern any thing like Vessels, though now they are so apparent.

Observations.
Fig. 37.

2. The *Anus* of the *Polype* may be discovered very plainly in this dried Object; whereas in a living one it requires much Attention to see it in a satisfactory Manner.

3. The Mouth, or Opening between the Arms, appears here like the Mouth of a Sack or Bag, which indeed the Body does not badly represent.

4. By observing the Arms thus dried, we obtain a clear Idea of the Means whereby this Creature catches fast Hold of it's Prey, the Moment of it's touching it, and before it can bring it's Arms to clasp about it: For we plainly see here, that the Arms are thick beset with Hairs, or rather sharp Hooks, which possibly are moveable, and can strike easily into the Body of a tender Worm. But these Hooks or Hairs

Hairs are not visible in the living Animal; being then, perhaps, somehow or other generally drawn in, or laid flat and close along the Sides of the Arms, as I have seen them in some Sorts of Star-fish. Besides, the Water wherein we are obliged to view a *Polype*, when alive, will not permit so strict an Examination as it can now be brought to.

Observations
on the Mouth of
the Eels in
Vinegar, also
a strange aqua-
tic Animal, by
the Rev. Mr.
Henry Miles.
With a Draw-
ing and De-
scription of the
said Animal,
as viewed in
the Microscope,
by Mr Baker.
F. R. S. No.
469, p. 416.
Read March
10, and 17,
1742-3.

Fig. 38.

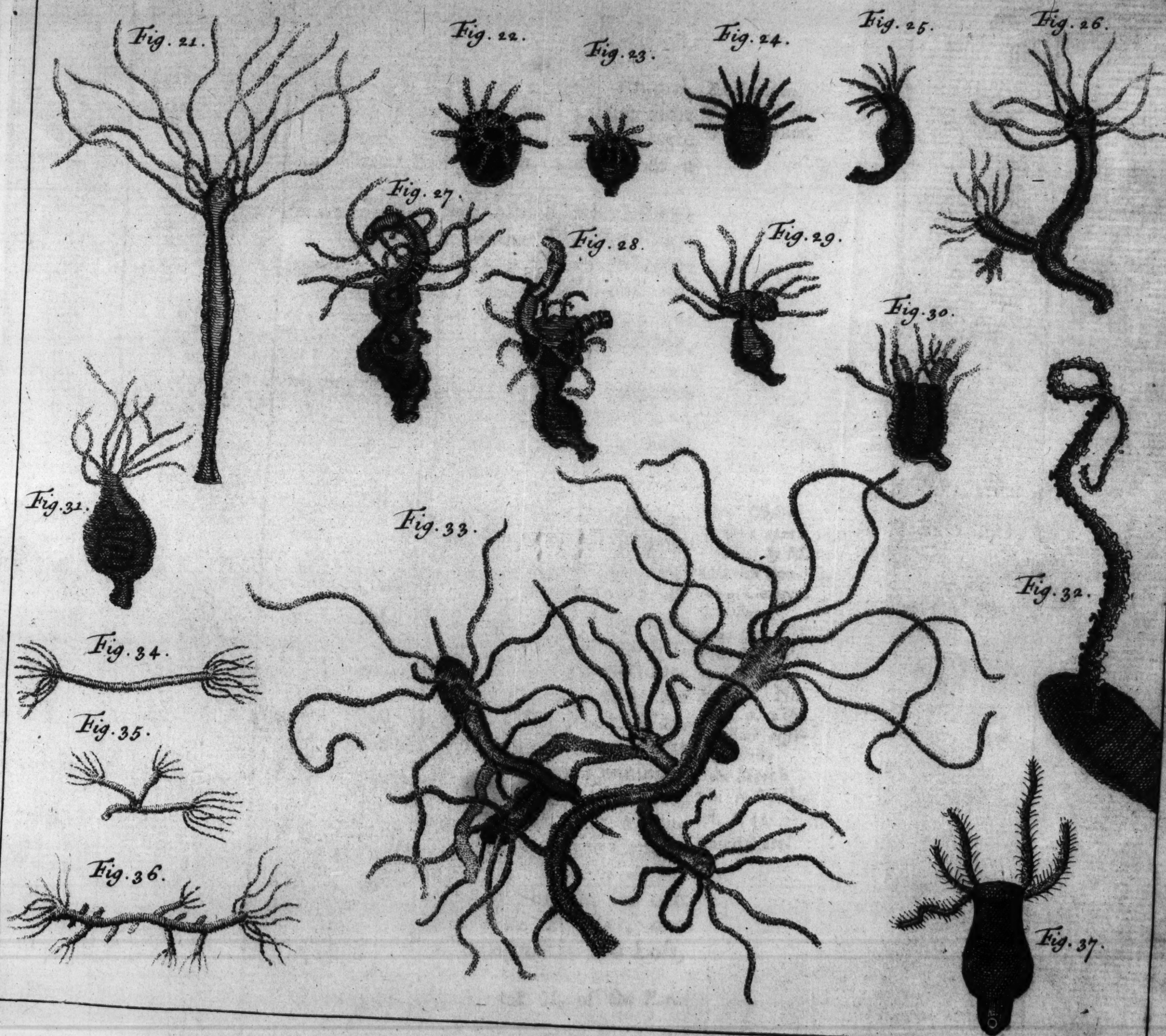
IX. I have made an Observation on one of the *Anguilla* in Vinegar (of which, I have a prodigious Increase, though I lost all by Accident about a Month since, to about a single Drop or two). The Observation was made with the *Camera Obscura* Microscope: First, in a very small Tube, not a capillary one, though approaching near it, I put a small Quantity of Vinegar with several *Anguilla*: At my first Sight of the Image on the Screen, I observed one to have a Motion as if it had been wounded, about the Middle of the Back, it neither rose nor sunk in the Liquor, but lay wriggling itself: I thought it gave Signs of Pain, and would soon expire, which it accordingly did in a Minute's Time; but it coiled itself up, and stuck to the Side of the Tube very close, before I was aware: I put out the Liquor, after waiting to see whether it would revive, in vain, and viewed it several Times in the common Light, which way I had the most distinct Appearance; and must acknowledge the Exactness with which it had coiled itself, gave me no small Pleasure to behold: The biggest End, which I call the Head, was stretched out from the rest of the Body, a little Way, which gave me an Opportunity I had wished for, of examining what Mouth it had. On my first View of it in common Light, I saw what I incline to think may be called the Mouth: Repeated Trials in different Lights and Positions, and with different Magnifiers, confirmed my Suspicion; for I saw no other Appearance of it, than what I ought to expect on such Alterations of the Glasses, &c. I would only add, that after the strictest and most exact Observation I could make, I could discern it to be nothing more than a transparent Tube. Where the Instruments of Nutrition, and the Springs of Life, are, I doubt we shall not soon discover. I once indeed thought, viewing it in the *Camera*, &c. I saw a Blood-Vessel, but I believe it was no more than refracted Light, or prismatic Colour.

Fig. 38.

a. The Mouth, which seemed to be as wide open as it possibly could be.

I am sensible my Figure is too small to give a just Idea of the Shape of the Mouth, but it had the Appearance which a Tube, or rather a Cone, would make cut slopewise.

I have further troubled you with an odd aquatic Animal found in standing Water: I kept some of them in their own Element in the House, but they all died in a Day and a half's Time. They seem to be nothing but Skin, and seem no thicker when alive: They have the Power, (as most aquatic Insects have) of sinking themselves to the Bottom on the Approach of a Stick, &c. and fall like a Piece of rotten



ten Wood or Leaf. When taken out of the Water, if laid on a Paper, &c. they will spring away like a Grasshopper. I do not at present remember ever to have seen them before, and know not what to make of them, unless they are the *Tipula*, or *Water Spider*, not yet arrived at it's mature State.

Tooting, March 9,
1742-3

Fig. 39. A. Represents an undescribed Kind of aquatic Animal, (lately observed by the Reverend Mr Miles of Tooting) in the same Size and Form as it appears to the naked Eye. Several of them were found in the Water of a Ditch; whence being taken, and laid on a Paper, they had a leaping Motion.

Explanation
of the Figure,
by Mr. Baker.

B. The same Animal, as examined by the Microscope, which shews it to be a triangular, oblong, opaque Body, somewhat like the Shape of a Prism, but tapering from End to End. The 3 Horns (whereof those on the Sides are a third Part longer than the Middle one) appear armed with extremely sharp Thorns or Prickles: The same Sort of Prickles are placed likewise along the Sides of the whole Body, pointing downwards from Head to Tail.

C. Shews the Form of a Body inclosed in the former, and taken out upon Dissection. This seems to be an Animal in it's Aurelia State; and if so, what has been before described is only it's Husk or Case, which will be quitted when it comes to change.

Quere, *What Animal is this in it's perfect State?*

X. It is well known, that among *Caterpillars* there are several Species, which like to live in Society, and which know how to build Nests wherein to shelter themselves against the Injuries of the Air. Of this Sort are those * to which Gardeners have given the Name of *Liverymen*, by reason of the Distribution of their Colours. They may be ranked among the Processioners, or those that follow one another. They all go about, spinning, with great Order: But what is most surprising, is to see them straggle very far from their Nest, and this often by several Windings and Turnings, without losing their Way. Their Art in doing it deserves Notice. They spin over all the Places where they go. The 1st leads the Way; the 2d follows spinning; the 3d spins after the 2d and 1st, and so on with the rest. All these Threads form by Degrees a small shining Track, a little Path, a *Line* or two *Lines* broad; and all these Paths meet at the Nest, the Center, as it were, of all those several Rays.

New Observations upon
Insects, by M.
Charles Bonnet of Geneva.
Translated
from the
French by P.
H. Z. Esq.
F. R. S. No.
470, p. 458.
Read at different
Times
from March
10, to April
28, 1743.
Caterpillars.

But to be plainly convinced of the Use of these Threads, let one but break off the Continuation of them in some Place or other, one will see with Astonishment the little *Caterpillars* turn back as at a Loss,

* *Memoirs pour servir à l'Histoire des Insectes*. Tom. I, and II, of the Paris Edition.

without daring to proceed, till one or other, of more Courage than the rest, has restored the Communication, by spinning new Threads.

Caterpillars have particular Tastes: I have observed some, to whom even the Shell of the Egg they were come out of, was agreeable Food. This Fact is not absolutely new. *M. de Reaumur* informs us *, that *M. Maupertuis* has made the like Observation.

But what I have seen more, and which will appear singular, is, that certain *Caterpillars* are not content with gnawing the Shell of the Eggs they came out of themselves, but will gnaw also those of other *Caterpillars* of their own Species, that are near upon hatching.

Another yet more remarkable Singularity in the Taste of certain Kinds of *Catterpillars*, of the Species of smooth ones, some of the first Class, and others of the Second, is, that they are fond of eating their own *Exuvie*; they have scarcely cast them off but they fall to devouring them. And this will appear still more surprizing, if one considers the Condition in which the *Caterpillars* then are. Every one has learnt from *Silkworms*, that, after the moulting, these Sort of Insects are extremely weak; and that for a considerable Time they remain without any Nourishment, to give Time to their new Organs, particularly their Teeth, to strengthen themselves: Yet here you see *Caterpillars*, which, immediately after this critical Operation, greedily devour not only the soft or rather tough Part of their Skin, but even all that is scaly in it, as the Skull, the Legs, &c. I have even observed some, which seemed to seize upon those, preferably to the rest, and to devour those almost bony Parts, before they fell upon the others, that are much less hard.

Nothing surprizes more in Insects, than their Industry; and *Caterpillars* yield to none in this respect: Not to speak of those which build for themselves Sheaths or Cases, in which Silk, their own Down, Bits of Bark, Pieces of Paper, &c. are so artfully wrought together; there is one † which builds in Wood, and is able to give it's Case a Hardness greater than that of Wood itself. I shall mention in few Words, how this Insect goes to work: It cuts the Wood with it's Teeth, which are very sharp, and severs small Fragments from it, which it binds together with a Silk of a particular Nature, and which seems to differ in several respects from that of other *Caterpillars*; it is properly nothing but a viscous Substance drawn into Threads, which, like Glue, grows hard by degrees.

But, probably, this would not suffice for giving to the whole Work the Solidity that is required, if the industrious *Caterpillar* did not, in some measure, prepare the Fragments of the Wood, before

* *Memoires sur les Insectes*, Tom. II. p. 165.

† The extraordinary horned *Caterpillar* of the Willow, *Memoires sur les Insectes*, Tom. II. p. 264. seq. *Goedart*. *Albin*. *Mrs Merian*. This *Caterpillar* is of the Kind which eat their own Skin.

it employs them; and this it does by keeping them in it's Mouth for some time, to soak and better fit them for joining themselves into one Body.

This Solidity of the Case of our *Caterpillar* is not what we need further trouble ourselves about; it suffices the best Care is taken of that Particular: But this *Caterpillar* is also to become a *Butterfly*, and we know, that *Butterflies* have neither Teeth nor Feet to dig withal: How then will this contrive to cut it's Way through a Case that is so hard, and so exactly closed up on all Sides? One guesses, perhaps, that it ouses a Liquor which softnes that sort of Glue which binds the Bits of the Sawdust together. But what is the Nature of this Liquor? M. de Reaumer † has judged, that it must be of a singular Kind. In dissecting some of these *Caterpillars*, I have found near the Mouth, under the *Oesophagus*, a sort of Bladder, of the Bigness of a small Pea, full of a limpid Liquor, and of a penetrating Smell, which I found by divers Trials to be a very active Acid, and which, among other Properties it has in common with true Acids, sensibly softens the Glue of the Case. It remains now to shew, that this Liquor is not only of Use to the *Caterpillar*, but is also that very Dissolvent which enables the *Butterfly* to cut it's Way through: And this I am not without Hopes of being able to compass.

A Notion adopted by Dr *Boerhaave**, that there are no true Acids in Animals, except in the Stomach or Intestines, renders this little Discovery of the more Concern.

We have seen from the foregoing Observation, that *Caterpillars*, though one of those Insects the Structure of which has been most searched into, have yet something still new to present in this respect. And I shall further add, that I have discovered in these Insects a Part of some seeming Consideration, which is a sort of Nipple, or fleshy Protuberance, placed near the Head, under the first Ring; which is commonly concealed in the Inside of the Body, but is forced to shew itself by squeezing the Insect. This Nipple, or Protuberance, which at first I only found single in several *Caterpillars*, I have since met with in others double, and even quadruple; as in that singular horned *Caterpillar* of the *Willow*, which I have already mentioned, and this with some remarkable Varieties. However, they are not all provided with them: I have not found them as yet, for Instance, in those of the first Size, that is to say, the very large ones, nor in those that are very hairy. But I have observed it in all those *Caterpillars* which, from the Figure and the Stiffness of their Hairs, have been called the *Thorny-ones*. The Use of this Part remains yet unknown to me: All that I know, and that I have learnt by my Experiments, is, that it is not essential to the *Caterpillar*.

† In the Place quoted above.

* Praxis Medica. Elementa Chem.

Caterpillars are of those Insects for which one has naturally such an Aversion, that it will easily be believed there are some that have an offensive Smell; and I have actually observed a small Kind of them that smell so like a Bug, that I have thought fit to give them that Name. But what perhaps will appear more strange, is, that there is also a sort of a middling Size, which are smooth, and, on the Approach of their Metamorphosis, have a very sweet Rose-like Scent; and whose Cases, being made of Earth and of Silk, preserve that Smell for Years together. The *Butterfly* of another *Caterpillar**, of the middle Size also, but hairy, gave, upon it's coming out of it's Case, a very sensible Scent of Musk.

Formica-Leo.

There are few Insects that have been so much and so deservedly admired as the *Formica-Leo*. However, a little Particular, curious enough, has yet escaped the most diligent Inquiries; and that is the Manner in which he goes to work, when he finds Stones in his Pit, too big to be thrown out with his Horns. Does he then forsake the Place where he settled at first? and does he go somewhere else to set a new Ambuscade? Or, does he remain in his Pit leaving the Stone there, which he has not been able to remove? Or, after all, does he at last contrive to get rid of it? and what Means does he use to bring this End about? By unwearied observing, I have at last had the Fortune to discover the Secret of his Management. I have seen, that in such Cases the *Formica-Leo* knows how to vary his ways of working: He comes out of the Ground, gets his hinder Parts under the Stone, so that it rests upon his Back, and then by Degrees pushes it towards the Top of the Opening, keeping all the while his Poise with great Care. Having thus forced it to the Edge of his Pit, he does not leave it there, for it might roll back again; he therefore pushes it farther off, and then retires to his Pit again.

But sometimes it will happen, that the poor *Formica-Leo* has not the good Fortune to keep the Stone in Poise all the Way and it rolls back again to the Bottom of the Pit, the Moment it was got to the Brink. This unlucky Accident does not, however, discourage him, but he goes patiently to his Work again, till he gets the Stone out. I have seen some of these Insects, that, after 5 or 6 Misfortunes like those I have mentioned, did not yet lose Courage.

The Naturalists will have us admire the Strength of the *Ants*, in transporting their Materials: That of the *Formica-Leo* is doubtless no less worthy of the Attention of all who shall see, as I have done, these little Animals carry to the Brink of their Pit, notwithstanding the Steepness of the Slope, and the Crumbling away of the Earth, Stones 3 or 4 times as big as themselves.

All the *Formica-Leos* that have been hitherto observed, move only backwards; but I have also discovered a Species that move forwards

* *Memoires sur les Insects*, Tom. I. Pl. 16. Fig. 8.

with Activity. These do not, like the others, lie in Ambush for their Prey, but seize on it by mere Force and Dexterity.

The *Pucerons* are pretty well known, so that it will be sufficient to take notice they are that sort of *Gnats*, or *small Flies*, which stick in great Numbers to the Leaves and Stalks of Plants, and cause great Destruction among them. What they present most curious, and which hitherto has been a sort of *Ænigma*, is their way of multiplying. "In every Family of the *Pucerons*, says M. *Reaumur**, there are "some with Wings, and others without. According to the usual "Analogy, the winged ones should be the Males, and those without "Wings the Females: But what is a great Singularity in the History "of Insects, is, that here both Sorts are Females. I have not been "able to find out the Males who impregnate both one and the other "sort. They all bring forth alive, &c." Is there therefore no Copulation among *Pucerons*? Or are they Hermaphrodites like Muscles? In order to know this, I tried an Experiment proposed by M. *Reaumur*†. I brought up, in perfect Solitude, a *Puceron* from the very Instant of it's Birth. The Expedient I had recourse to for this, was different from that which M. *Reaumur* had pointed out. It was such as gave me a Facility of observing the little *Puceron* at any time, without Fear of letting in another. I constantly watched it from Day to Day, and from Hour to Hour, for above a Month, usually beginning my Observations about four or five in the Morning, and scarcely discontinuing them till towards nine or ten at Night. I took care to keep an exact Journal of it's Life, wherein I noted even it's least Motions, and the most trifling Circumstances. At the End of about 12 Days it began to breed, and has since brought forth 95 young ones, all alive, and most of them under my own Eyes. I have drawn up a Table, in which I have marked, with the greatest Exactness possible, the Day and the Hour when every one of them was brought forth.

I have already repeated this Experiment, 3 several times, and with equal Success. I have even brought them up successively in Solitude, as far as the Fourth Generation; and all of them have brought forth.

Perhaps one is already from hence inclined to think, that there is in general no Copulation among the *Pucerons*. But there will yet be some room for Surprise, when I say, that I have also observed a Species of them where Copulation does obtain, as it does among so many other Species of Insects or Animals. The Male, like that of the Gall-Insects, has Wings, and is a good deal less than the Female. It is, perhaps, one of the most eager Creatures in that respect that is in Nature: I have seen it copulate a great many times in one Day, both with the same Female, and with others.

The ordinary Distinction of the Sex is not the only Singularity I

* *Memoires sur les Insects*, Tom. III. in the Preface, pag. 15.

† Pag. 329.

have met with in this Species of *Pucerons*: It has shewn me another no less remarkable. The Females, instead of bringing constantly forth live *Pucerons*: sometimes produce only *Fætuses*, which they lay one alongside of the other, as *Butterflies* do their Eggs.

Besides what relates to Generation, the *Pucerons* have afforded me many other curious Particulars. I have seen, for Instance, some, which to cast off their Coats, have given themselves Motions analogous to those of the *Cbrysalis* of the *thorny Caterpillar* of the *Nettle*: But to enter into all the Particulars I have met with in these small Insects, would require a Volume.

Of Insects
which are
multiplied, as
it were, by
Cuttings or
Slips.

M. *Tremblay*, wrote to me some time ago from the *Hague*, that he had discovered a sort of aquatic Production* of a Nature between a Plant and an Animal; that is to say, which moved, and which had the outward Appearance of a Plant, together with the Property of reproducing what was wanting, after being cut or divided into 2 or 3 several Parts. So extraordinary a Production could not fail exciting my Curiosity, so much the more, as my Friend did not enter into any Particulars. I spared no Pains to get some of these little Bodies, but all in vain. I only discovered a sort of a long Worm, extremely nimble, upon which I resolved to try the Experiment. As nothing could leave the least Doubt, but that this Insect was truly an Animal, I was assured, that, if my Experiments succeeded, I should fully make out, that there are really Insects to which Nature has given that strange Prerogative of being multiplied, as it were, by Cuttings, and thereby strongly confirm M. *Tremblay's* noble Discovery. The Success perfectly answered my Expectation, and I soon had the Pleasure of seeing two Worms made out of one. But before I enter into farther Particulars, it will perhaps not be amiss to give a slight Idea of the Structure of those Worms. Simple as they seem at their first Appearance, we no sooner examine them with Eyes prepared and armed with Magnifying-glasses, but we discover Parts no less proper to excite and fix our Attention, than in those Animals we call the most perfect.

Their Colour is generally a reddish-brown, or, more exactly, that of the first Peel of an *Onion*. Their Length is about 2 or 3 Inches; their thickness that of a common Wire: They are slender, composed of a Series of membranous Rings, continually growing less and less as they approach the Extremities; each of these Rings is furnished in it's inferior Part with 4, 5, or 6 different sorts of whitish Thorns, supplying the want of Legs. Besides these, the outside of the Worms still presents some other remarkable Particulars, and which afford an agreeable View to the Microscope; these are the Muscles that serve for the Motion of the Rings, and which form an infinite Number of circular Lines or Folds, parallel to each other, which, from the Clearness of the Skin, appear to great Advantage: The Head has not

* See above, Sect. VIII.

a constant Figure, like that of other Animals; the Insect stretches it, shortens it, enlarges it, and contracts it at Pleasure: Sometimes it shews 2 small Elevations one on each Side, which one would think should be the Places of the 2 Eyes; what is beyond, terminates in a Point, to make it more easy for the Worm to pierce the Mud. At the Place where the Head is biggest, between the two Elevations just now mentioned, the Mouth is placed, terminated by two brown Strokes, which may be compared to the Figure of a Half-moon, or rather that of a reversed Circumflex. When the Insect opens this Mouth, the Opening, which then appears distinctly, is of a circular Shape, and garnished all round with a pretty thick Muscle; it is in great measure this Muscle, that, by applying itself exactly with it's Circumference to a smooth and perpendicular Surface, enables the Insect to make it's Way in such Cases. At the other Extremity of the Body, is an oblong Opening, the greater Diameter of which runs parallel to the Length of the Animal, and this gives Passage to the Excrements.

But there is nothing more remarkable than the great Artery in these Worms. This Vessel, which the famous *Malpighi* looked upon as a Chain of Hearts, and which in *Caterpillars*, as well as in many other Insects, extends itself in a strait Line all along the Back, is here more or less folded in different Parts of it's Extent; from one End to the other, it is often nothing but Folds and Doublings: Through these crooked Passages, creeps along a Liquor analogous to Blood; from Moment to Moment you may see a Drop of that Liquor, which, setting out from the Extremity of the Tail, runs successively through all those Windings, and at last loses itself in the Brain. It is easy to trace it most Part of it's Way, by the alternate Motions of Contraction and Dilatation, which are successively excited from Ring to Ring. It seems as if every Part of this Artery, comprehended in the Breadth of one of those Rings, is really a complete Heart, which pushes on, to that which follows next, the Drop of Liquor it has just received from that which precedes it. One can hardly be tired with Admiration of the Appearance which those continual Motions of *Systole* and *Diastole* afford: But the better to perceive it, one should fix one's Eyes upon the Middle of the Body, where the Artery is largest in Diameter; for towards the 2 Extremities things are not to be seen so distinctly. Towards the Head, about the fifth or the sixth Ring from it, the Artery appears but like a Thread, scarcely discernible, and which, still diminishing continually till near the Mouth, there absolutely ceases to be visible: But what ought most to be taken notice of, is the prodigious Swiftnefs with which the Course of the Blood is accelerated in this Place; it seems as if it were darted forcibly into the Brain. Towards the Tail, for the Length of several Lines, it looks as if there was no longer any of the same Play; those alternate Contractions and Dilatations, so remarkable in the middle of the Body, here confound themselves.

themselves with each other, so as to be no longer distinguished: In the stead of them one only sees certain Undulations or Layers, as it were, of Clouds, succeeding one another with great Regularity.

Under every Junction of the Rings, are to be observed small Vessels with several Branches, all which seem to be Productions of the principal Artery.

All along, and immediately under this Artery, is extended the Channel of the Intestines, less visible of itself than by the terrestrial Matters with which it is commonly filled: It is furnished, like the Intestines of larger Animals, with different Orders of muscular Fibres, which serve to push on, and thrust out, the Remainder of the Food. If one does not discover these Fibres by the Eye, one may, at least, know and judge of them by the Effects: One may see with Amusement, how the Excrements are driven on by Degrees towards the *Anus*, the Transparency of the Skin discovering easily what is under it. However, by reason of the various Motions the Insect gives it's Body, these others just described appear for some Space retrograde.

The Earth from which these Worms receive their Nourishment, and which they digest, is not however the only Matter which is admitted into their Bodies; the Air often enters also in Bubbles that are very perceptible. But whereas Fishes have the Air in their Bodies at their own Command, and can make use of it for raising or sinking themselves; our Worms, on the contrary, are, in some measure, mastered by it: As soon as they happen to swallow a certain Quantity of it, it is hardly possible for them, notwithstanding their continual Efforts, to get to the Bottom of the Water; and they are forced to remain on the Surface, till they have got it all out again. I have seen some of these Bubbles alternately driven towards the *Anus*, and repelled towards the Head, for several Minutes together.

These are the principal Particulars, which the Microscope enables us to discover in the Structure of these Worms; which being once known to a certain Degree, we shall, without doubt, the more admire the Wonders of their Reproductions.

I mentioned above, that I had divided one of these Worms in two. I put these Halves into a Sort of Glass Cup, filled only with Water, and attentively watched them during the following Days. I observed that the first Moiety, that which had kept it's Head, moved as usual; but what seemed to me far more remarkable, was, that the other Moiety, that had no Head, moved almost as if it had one; it went forwards, resting itself upon the anterior Extremity of it's Body; and even made it's Way with tolerable Swiftmess. One could see, that this was not a Motion without Direction, a Motion produced by a Cause like that which makes the Tail of a *Lizard* move, after it has been severed from the Trunk, but a Motion quite voluntary, the Principle of which seemed not to have been destroyed: One saw it turn aside at the Meeting of an Obstacle, stop, and then creep forwards again.

When

When these two Moieties happened to meet, it was as if they had never composed one and the same Insect; they neither seemed to seek nor to fly each other; each went on it's own Way, or, if they went in Company towards the same Place, the first generally outran the second. But this latter never seemed to shew a Sort of Will of it's own more plainly, than when I exposed it to the Sun; for then it considerably quickened it's Pace.

I had many times Opportunities of admiring the extreme Nicety of the Feeling in these two Moieties, and especially in the Second. When I approached to it the End of a Splinter, at a time when it was quiet, it seemed to wake, as it were, in a Start, even almost before I had touched it.

Two Days being past, I thought fit to put into the Cup a little Duck-weed and Earth: The first Moiety soon thrust itself among it, but the second was satisfied with hiding itself among the small Roots of the Weed. I then observed, that, at the Place where it had been cut, there was come out a Sort of little Swelling, or Knob, analogous to that which commonly comes out on the Branch of a Tree stript of it's Bark. I did not distinguish this so well in the other Moiety; this Knob seemed to give the second Moiety more Ease in advancing, and it no longer seemed to be so much affected by all that touched it.

Next Day I took Notice, on the Wound of each Moiety, of a small Accretion, distinguishable by the Difference of Colour, which was there much clearer than in the rest of the Body; the following Days it became yet more perceptible. In short, at about a Week's End, each Moiety was again become a compleat Worm. The Head that had sprouted out on the second Part, was, as to it's Form, exactly the same with that of the first, and equally fit for all the same Functions. Again, the new Tail of the first was in every respect like the old one. The Heart, the Stomach, &c. had prolonged themselves in one and the other, and the Parts newly produced acted with no less Vigour than the rest; and new Rings had besides been produced successively beyond the old ones.

I took care, from Time to Time, to measure, with as much Exactness as I could, the Growth of my two Worms; and I intended to watch them on, with the same Attention; when, at the End of about 8 Days, to my great Surprise, they had found Means to escape.

This Experiment, which I thus could not pursue as far as I had wished, seeming to require Repetition, I undertook it again, with the same Care: The Success did not fail answering: I soon had the Pleasure to see my two Moieties recover what they wanted, and become such as they had been before.

I afterwards tried to carry the Division farther, and to divide some of these Worms into 3, 4, 8, 10 and 14 Pieces; and all, or almost all, recovered both Heads and Tails.

In short, to say still more, I cut some of them, even in the midst of Winter, into 24 and 26 Parts: Of the first Division into 24, there are about 16 or 17 full of Life, and most of which begin to complete themselves. Of the second Division into 26, there still remain 7 or 8.

Since my writing what is before, some of these Pieces of Worms have perished, though they had begun to complete themselves. I have Reason to believe, that, when I shall repeat my Experiments in a warmer Season, more of the Pieces will thrive, and become complete Animals: It was proper, however, to try them in Winter, to see the Difference of their Success and Progress. It is worth Notice, that some very small Parts of those two Worms, one of which was divided into 24, and the other into 26 Pieces, lived about 3 Months, and that in the Winter. For though they were in my Closet, yet the Liquor in M. *Reaumur's* Thermometer did mostly stand between 4 and 8° above Frost, which Degree of Warmth is very inconsiderable; and often, particularly in the Night-time, it was 2 or 3° lower.

It is commonly 1 or 2 Days after the Operation in Summer, but about 10 or 12 in Winter, that the Head and the Tail begin to shoot on those Parts where they were wanting. The Head shews itself first, and lengthens itself continually, for a Week, or more, till it has attained the Length of about a Line and half; and then it ceases to grow. I do not here mean, that the proper Head has actually that Length; very far from it: But I here give that Name also to 5 or 6 Rings, which are contiguous to the Head properly so called. It is not so with regard to the Tail, which, having soon surpassed the Head in Length, does not leave off still extending itself; but increases, from Day to Day, so that I do not yet know how far it may go. I shall content myself with saying, that Pieces of those Worms, which, in the Month of *July*, immediately after the Operation, were not quite 2 Lines in Length, are at present near 2 Inches long: But what may be thought more remarkable, is, that some such Pieces have made in the same Time as much Progress, as others 4 or 5 Times as long. I have compared the different Growths of the first Moiety of a Worm about 2 Inches long, cut on the 18th of *July*, with those of some of the Pieces of a like Worm cut the same Day into 8 Pieces; and was surprised to find the Quantity of Growth near the same in both Cases. However, it appeared that when the Division was yet carried further, the Pieces thence arising reproduced what they wanted more slowly than the others.

But if, instead of making this Comparison between the Pieces of different Worms, we make it between those of the same Worm, we shall observe Variations which we perhaps would not have expected. Some of these Pieces will be 12 or 15 Lines long, whilst others will hardly be 4 or 5. I have done my utmost to find among those Variations some fixed Point, some Rule, not contradicted by Experience; and it has appeared to me in general, that the Pieces nearest to the Tail are those

those which make the least Progress. Among this Number is chiefly to be reckoned the last. As to the first, that which keeps the Head, though that is often the Piece which in an equal Time recovers the longest Tail, yet does not this happen so constantly as to build a Rule upon it. My Observations have furnished me with more than one Proof of this. Neither is it a Rule, that all the intermediate Pieces, which have recovered Heads, will also recover Tails: I have Examples to the contrary. But what seems certain, is, that the State of the Worm, the Number of it's Divisions, and other Circumstances, seem very much to influence all those Irregularities.

The Want of Nourishment, or of such as is proper, may also be a Cause, and that a very natural one, of like Variations. I said above, that those Worms love to be in the Mud, and that they digest it. Those Pieces which I left purposely in clear Water, have usually very well recovered what they wanted to become true Worms; though afterwards they made but little Progress, and almost all successively perished.

The learned Dr *Hales* * relates a curious Experiment; by which he proves, that the Bones of Animals, when they are ossified to a certain Degree, do not grow any longer but at their Extremities. Many Observations have convinced me, that it is the same with our Worms. The old Piece, I mean that which was originally cut from the Worm, does not itself lengthen, but it's Increase is only owing to the Growth of those additional Parts, that put out at each Extremity.

* *Vegetable Staticks.*

It is certainly very singular, that the Circulation of the Blood, the Regularity of which appears so essential, yet in certain Insects suffers considerable Changes. Such are those which *Malpighi* has observed in the Silk-Worm. And I do not know if it is not as remarkable, that those I am speaking of, have never shewed me any of those Variations, at whatever Time, or in whatever State I have yet observed them, either whilst entire, or when cut into several Pieces. I have constantly, in all these Cases, seen the Liquor that serves them instead of Blood, circulate from the Tail towards the Head, and that in Pieces which were scarcely half a Line in Length, or which, to speak more properly, were only *Granulæ* of Flesh.

I was, by this, able to distinguish the anterior End from the posterior; and to be as sure as possible, that it is always the anterior, on which the Head appears again.

Among those Plants that may be raised from Slips and Cuttings, there are some that seem to have this Property to such a Degree of Perfection, that the least Twig will become a compleat Plant again. Hath the great Author of Nature, when he ordained, that certain Insects, like our Worms, should resemble those Plants in this Particular, allowed them the Power of being reproduced to the same Degree? Or, which is the same thing, will this Reproduction take Place in whatever Part the Worms are cut? I have thought this worth inquiring

into. In order to it, I cut off from one of these Worms both the the Head and the Tail; that is to say, I parted from each of it's Extremities a Piece of the Length of about a Line. Both Pieces perished in about 24 Hours, the Tail first and the Head after. As to the Body, it continued to move almost as if I had not made the Operation. I have even seen, what appeared to me extremely remarkable, that, a few Moments after, it thrust itself into the Mud, making use of it's anterior Extremity, as of a Head, to bore it's Way through. I have repeated this Experiment with the same Success: So that I am confident I may assert, that there are in the Body of these Worms at least 2 Points, where, if they are cut, the Reproduction will not take Place. The one is about the 5th or 6th Ring from the Head; the other, at an equal Distance from the Extremity of the Tail. Is not, perhaps, the Condition of the great Artery in these two Parts the Cause of it? This indeed seems to me probable; remembering, however, that what I have just said only relates to the 2 Pieces detached from those Extremities; for, as to the intermediate Body, it not only continues to live, but it is even not long before it regains all that was taken from it. Where then does the Principle of Life reside in such Worms, as after having their Heads cut off, still shew not only the same Motions, but even the same Inclinations? Yet what is this Difficulty, compared with many others, that at the same time present themselves to our Mind? This wonderful Reproduction of Parts, is it only a natural Consequence of the Laws of Motion? Or does it rather depend on a Chain of minute Buds or Shoots, a Sort of little Embryos, already formed, and lodged where the Reproductions are to begin? Are these Worms only mere Machines, or are they like more perfect Animals, a Sort of Compound, the Springs of whose Motions are actuated by a kind of Soul? And, if they have within themselves such a Principle, how can this Principle afterwards appear in every distinct Piece? Shall we grant, that there are in these Worms as many such Souls as there are Pieces of the same capable of becoming complete Worms? Shall we believe, with *Malpighi*, that these Sorts of Worms are all Heart and Brain, from one End to the other? This may be; and yet we know but little the more for it.

The Nicety of the Sense of Feeling in Spiders has been much talked of; yet do not I know whether our Worms may not, in this Particular also, shew something still more surprising. I have already observed, that upon bringing near them the End of a Splinter, they begin to frisk about, almost before it reaches them: And I have since made other Experiments, which leave me in doubt, whether it is not rather to their Sight than to their quick Sense of Feeling, that I ought to ascribe what I observed in this respect. I have found, that, when the first Rays of the Sun came to fall upon the Vessels of Water in which I kept those Insects, their Motions seemed presently to become more lively. I have fancied, at least, that I saw the same thing, when, after having

having put them into the Shade, I threw the Light of the Sun upon them from a Looking-glass, or when I observed them by Candle-light: But what seems less liable to Mistake, is, that I have seen some of them creeping about in the Moon-shine, that in the Day-light kept themselves constantly folded together. I would not, however, venture to determine any thing upon this, till I am better satisfied by new Experiments.

A Twig of *Willow*, *Poplar*, &c. planted in the Earth, takes Root there, and soon becomes a Tree, the least Twig of which will, in it's Turn, become another. There is no End of this; and it is the same with our Worms. If we cut those that have been produced by Section, and do not carry the Division at once beyond 12 or 15 Pieces, we shall not fail of having so many Animals. I have had Worms from the Fifteenths, and even the Twentyfourths, of former Halves and Quarters; and I reckon, that in Two Years time I might, if I would, breed after this manner 40 or 50 thousand Worms from one single one.

But how do these Worms propagate? Are they *viviparous* or *oviparous*? I shall just mention an Observation that to me seemed singular: As I divided one of these Worms into 8 Pieces, I saw some earthy matter ouising out of one of the Pieces near the Head, in the midst of which I perceived something moving like a whitish Thread. I, at first, made no doubt but it was some Vessel, or like Piece of the Body of the Insect, which, not being quite separated from it, might still draw from thence the Principle of it's Motion: But, taking to my Assistance a good Magnifying-glass, I was much surprised when I saw, that this supposed Vessel was a small Worm, and exactly of the Figure of that, in the Body of which it had before been inclosed. I immediately resolved to bring it up; and, to this End set it apart in a small Vessel filled with Water, into which I put also a little Earth. It was not long before I was sensible, from the Quickness with which it thrust itself into it, that I had satisfied it's Wants: However, from time to time, it came out again, and swam about. I could not but admire the Liveliness of all it's Motions; and it was much like one of those little *Eels*, which, by the Microscope, are discovered in Vinegar. I watched it thus above 6 Weeks, when, by an unforeseen Accident, I lost it: I was, however, already, in part, informed of what I hoped to learn; I mean, whether this Worm, which I had brought into the World by a sort of *Cæsarean* Operation, would not only continue to live, but would also acquire a greater Length; and this I had seen happen; for the Worm, which at first was hardly a Line in Length, was above as long again, when I had the Accident of losing it. It seems therefore natural to think, that if it had lived longer, it would have been a Worm exactly like that it came from. And I have looked upon this as

the more probable, because thirds of those Worms have also produced others and exactly like themselves.

I have examined some of these little Worms with the Microscope, and observed 2 Particularities in them, which I have thought worth Notice: 1st, Long Hairs placed on the Sides of the Body, Two at each Joining of the Rings. 2^{dly}, That the Chanel of the *Intestines*, the great Artery, &c. appeared interrupted for about $\frac{2}{3}$ of the Length of the Body, so that for a Space, which to the Microscope appeared of about 2 Lines, the whole was so transparent, that nothing could be distinguished; whereas every-where else, except about the 5 or 6 first Rings, the Parts in Question were plainly visible: And especially the Stomach, by reason of the earthy Substance it was filled with. I have Reason to think, that these small Worms, observed again with fresh Attention, will shew me still something new, in their internal Parts. I divided one on the 28th of *March*, in the Place where I have said that the *Viscera* appeared interrupted. Next Day the 2 Pieces buried themselves in the Mud; and on the first of *April*, being both applied to the Microscope, the latter was found to have already got a Head as well formed as that of the other Piece, and which had already begun to perform it's natural Office of giving Admittance to the Food. It is remarkable, that Worms so tender, and so small, go through the Operation so well, and complete themselves so speedily even in cold Weather. This confirms what I shall observe below, that the more slender these Insects are, the sooner they complete themselves.

This unexpected Observation set me upon examining more carefully the internal Parts of these Worms. With the Help of a good Magnifying-glass, I thought I distinguished, in the Inside of one of the biggest on both Sides of the greatest Artery, small Worms like those I have spoken of above: I saw them move different Ways, extend themselves, and wriggle about. But, having had recourse to the Microscope, I began to doubt whether that I had before seen was really what it seemed to be. It then appeared, that what I had taken for Worms, were rather the Branches of those Vessels, accompanying the great Artery, and participating of the Motions of the *Systole* and *Diastole* of that Vessel. Nevertheless, having again resumed several times these Trials, I have again been persuaded, I saw the same Appearances of small living Worms; which makes me still uncertain of the Truth of this Particular, and unable to determine what I ought to think.

We cannot enough admire nor acknowledge the wise Conduct of Nature, in the Multiplication of the Species of Animals and Vegetables; forasmuch as we see, that those which are most useful to us, commonly multiply, either in a greater Proportion, or may be raised with greater Ease. But what End could that Wisdom, which does nothing in vain, have proposed to itself, in granting to such Insects as
these

these a Property and Prerogative, which Animals, far more excellent in our Judgment, seem no ways intitled to? It is even certain, that these Insects naturally make use of this Power; and it is really true, that the same Wonders I have seen operated in my Glasses, are also performed every Day in the Brooks where they live. I have there met with Worms, some of which had yet no Heads, and others that only began to recover them. But, which is more, I have found some in the same State as those which had lost both their Heads and their Tails, or which had been divided into more than 2 Pieces; and all these have afterwards fully completed themselves under my Eyes. Can this therefore be a natural way of multiplying with these Insects? Is it necessary, that, in order to bring forth new Worms, their Body should be divided and broke to Pieces? Or those which I have found divided, were they so only by any Accident? I could hardly have hoped, that my Observations would have furnished me with Answers to these or the like Questions: But Worms of this sort, which I kept entire, having divided themselves of their own Accord, have made me think, that this Accident sometimes proceeds from their having thrust themselves too far into the Earth, or from that Earth's being of too hard and resisting a Nature. It may therefore seem the more fit, that these Insects, whose Bodies are very tender, and liable to be separated, should reproduce what they lost in the manner I have been speaking of. I have farther observed, that they are subject also to a sort of Distemper, analogous to the Gangrene, that sometimes rots off considerable Parts of their Body; which, however, they recover afterwards, like those others which have had the same Parts cut away.

Another sort of Worm, upon which I have begun to make Trials, is also found in the Water. It differs particularly from that I have been speaking of, in that it is considerably thicker. I have divided some of these in the Summer Season into 2, 3, and 4 Pieces. Some have recovered the Head and the Tail; but that only after the Space of 20 Days, during which they always lay like dead. They lived above a Month after, in a State very little different, as to outward Appearance; and afterwards perished, without making any farther Progress. The considerable Difference between the Times in which the Pieces of these last Worms complete themselves, and those employed by the former, with the greater Difficulty in their Success, do they not chiefly proceed from their Thickness? And is it not possibly a Rule, that the slenderer Worms of this Class are, the sooner the Pieces separated from them will resume what is wanting? I should incline to think it is so.

But if the Water has it's Insects, thus produced from Cuttings, the Earth is not absolutely without them. It also contains some perhaps yet more deserving our Admiration, than all that have hitherto been observed in this Kind. Every body now knows that the Earth-Worms are *Hermaphrodites*, but not such as I have shewn the *Pucerons* to be: That is to say, that an Earth-Worm, though it is of both Sexes,

cannot engender without the Concurrence of it's like. I have therefore divided some of these into 2 and others into 4 Pieces; and some of them, at the End of about 3 Months, which they have passed in a sort of Lethargy, did then proceed to resume both Heads and Tails. The Reproduction of the *Anus* is no long Work, a few Days are sufficient for it; but it is otherwise with the Head; that does not seem to perform it's Functions in the Pieces of divided Worms, till about 7 Months after the Operation. Now what further excites my Curiosity, is, to know, whether they will copulate; if they do, the Wonder will be at it's highest Pitch. As for what remains, I have made a Remark, not to be here passed over, both upon Earth-worms and Water-insects; which is, that the posterior Parts always appear to suffer more in the Operation than the anterior. We see the former immediately giving itself, as it were, convulsive Motions, whilst the latter, almost constantly, moves about as usual.

I have also made Experiments, but without Success, on some sorts of terrestrial Millepedes; likewise on several of those kinds of Worms which metamorphose themselves into *Tipula*, or Water-spiders; but no one of them has succeeded.

These are the Observations I have begun to make upon so interesting a subject. If they are compared with what still remain to be made, they must appear extremely imperfect; and I myself look upon them as no other than a rough Sketch of what others may possibly do hereafter.

Geneva, March

14. 1742. N. S.

Concerning the
*Squilla aquæ
dulcis*, by
Richard Rich-
ardson M. D.
F. R. S. No.
433. p. 331.
dated Sept. 5.
1733.

XI. I do not remember that any Naturalist; has taken notice of the great Destruction that is made amongst the small Fry of Fish by the *Squilla aquæ dulcis*, which abound in most standing Waters. In a small breeding Pond nigh my House, where I had formerly plenty of small Carp and Tench every Year, and of late scarce any young Breed to be met with, my Gardener not long ago observed one of the *Squille*, with a Carp in it's Mouth almost as large as itself; and has since observed these Insects hunting amongst the Weeds, and vigorously pursuing the small Fry. I ordered the Gardener to catch some of these Insects, and bring them home alive, with some of the smallest Fish he could meet with. We put them together in a large Basen of Water. The Insects were so rapacious, that they fell upon the Fish immediately, and destroyed several in my Sight; and before Morning had devoured all that were in the Basen.

Conjectures on
the Charming
or Fascinating
Power attri-
buted to the
Rattle-Snake:
grounded on
credible Ac-
counts, Expe-

XII. 1. The various Relations not only of curious and credible Authors, who have given us Accounts of *Virginia*, *Carolina*, and the neighbouring Countries, but also the Testimonies of several Men of Integrity by word of Mouth, concerning what they call Charms, Inchantments, or Fascinations by Snakes, have often seemed to me greatly surprizing, without my being able to satisfy myself of the true Cause of such Appearances.

These

These Opinions are the greatest Support of a common Notion, that several chronical wasting Diseases, and such Disorders of the Nerves as are not easily accounted for, not only in Men, but in cattle, are believed to be the Effects of an evil Eye of old malicious Women, &c. thought to be Witches and Sorcerers, or assisted by the Devil.

In particular as to *Rattle-Snakes*, they all agree in their Relations, that those Snakes keeping their Eyes fixed on any small Animal, as a Squirrel, Bird, or such like, though sitting upon the Branch of a Tree of a considerable Height, shall, by such stedfast or earnest Looking, make or cause it to fall dead into their Mouths. This is a Thing so well attested, that they think there is no reason to question their belief of it.

Mr *Read*, an eminent Merchant in the City of *London*, had a *Rattle Snake* sent him alive in a Box with some Gravel from *Virginia*, which he did me the Favour to give me. It had lived 3 Months before without any Sustenance, and had in that time parted with it's outer Coat, or *Exuvie*, which was found amongst the Gravel. Mr *Ranby* undertook the lodging it: And Captain *Hall*, ventured to take the Snake out of the Box; notwithstanding the Poison from the Bite thereof is almost present Death: For he gave us an Instance of a Person bitten, who was found dead at the Return of a Messenger going to the next House to fetch a Remedy, or Antidote, though he was not gone above half an Hour. Nay, so certain are the mortal Effects of this Poison, that sometimes the waiting 'till an Iron can be heated, in order to burn the Wound, is said to have proved fatal. This Gentleman told me he thought the securest Way was immediately to cut out the Part where the Wound was made; for he had seen several, who carried these hollow Scars about them, as Marks of the narrow Escape they had had, and never felt any Inconvenience afterwards.

Though Providence hath produced a Creature so terrible to other Animals, yet it seems to have provided it with the Rattle at it's Tail, that the Noise thereof might give warning to them to get out of it's way.

I desired an Experiment should be tried before several Physicians; which was accordingly done in the Garden belonging to their College in *London*. The Captain, by keeping the head fast with a forked Stick, and making a Noose, which he put about the Tail of the Snake, tied it fast to the end of another Stick wherewith he took him out of the Box, and laid him upon the Grass plat. Then a Dog being made to tread upon him, he bit the Dog, who thereupon howled very bitterly, and went away some few Yards distant from the Snake: But in about one Minute of time he grew paralytic in the hinder Legs, after the manner of Dogs who have the *Aorta descendens* tied. He died in less than three Minutes time, as is related by Mr *Ranby*, in an Account of this Experiment, and by Captain *Hall*. See Vol. VII. Part III. Chap. I. §. vii. 2, 3.

*riments and
Observations.
By Sir Hans
Sloane, Bart.
Pres. R.S. and
Coll. of Physi-
cians, &c. N^o.
433. P. 321.
July, &c.
1734.*

In my Opinion the whole Mystery of their enchanting or charming any Creature is chiefly this: that when such Animals as are their proper Prey, namely small Quadrupeds or Birds, &c. are surprized by them, they bite them; and the Poison allows them time to run a small Way, as our Dog did, or perhaps a Bird to fly up into the next Tree, where the Snakes watch them with great Eagerness, 'till they fall down, or are perfectly dead, when having licked them over with their Spawl or Spittle, they swallow them down, as the following Accounts relate.

‘ Some People in *England* (says Colonel *Beverley* †) are startled at
 ‘ the very Name of the *Rattle-Snake*, and fancy every Corner of that
 ‘ Province so much pestered with them, that a Man goes in constant
 ‘ danger of his Life, that walks abroad in the Woods. But this is as
 ‘ gross a Mistake, as most of the other ill Reports of this Country.
 ‘ For in the first Place, this Snake is very rarely seen; and when that
 ‘ happens, it never does the least Mischief, unless you offer to disturb
 ‘ it, and thereby provoke it to bite in it’s own Defence. But it never
 ‘ fails to give you fair warning, by making a Noise with it’s Rattle,
 ‘ which may be heard at a convenient Distance. For my own part,
 ‘ I have travelled the Country as much as any Man in it of my Age,
 ‘ by Night and by Day, above the Inhabitants, as well as among
 ‘ them: And yet before the first Impression of this Book, I had
 ‘ never seen a *Rattle-Snake* alive, and at Liberty, in all my Life. I
 ‘ had seen them indeed after they had been killed, or pent up in Boxes
 ‘ to be sent to *England*. The bite of this Viper, without some
 ‘ immediate Application, is certainly Death: But Remedies are so well
 ‘ known, that none of their Servants are ignorant of them. I never
 ‘ knew any killed by these or any other of their Snakes, altho’ I had a
 ‘ general Knowledge all over the Country, and had been in every part
 ‘ of it. They have several other Snakes, which are seen more frequently,
 ‘ and have very little or no hurt in them: viz. such as they call *Black-*
 ‘ *Snakes*, *Water-Snakes*, and *Corn-Snakes*. The black *Viper-Snake*,
 ‘ and the Copper-bellied *Sneeke*, are said to be as venomous as the *Rattle-*
 ‘ *Sneeke*; but they are as seldom seen. These three poisonous Snakes
 ‘ bring forth their Young alive; whereas the other three sorts lay Eggs,
 ‘ which are hatched afterwards; and that is the Distinction they make,
 ‘ esteeming only those to be venomous, which are viviparous. They
 ‘ have likewise the *Horn-Sneeke*, so called from a sharp Horn it carries
 ‘ in it’s Tail, with which it assaults any thing that offends it, with that
 ‘ Force, that, as it is said, it will strike it’s Tail into the But end of
 ‘ a Musket, from whence it is not able to disengage itself.

‘ All Sorts of Snakes will charm both Birds and Squirrels, and the
 ‘ *Indians* pretend to charm them. Several Persons have seen Squirrels
 ‘ run down a Tree directly into a Snake’s Mouth. They have like-

† Hist. of Virginia, Ed. 2. p. 260. Lond. 1722. 8vo.

' wife seen Birds fluttering up and down, and chattering at these Snakes,
 ' 'till at last they have dropt down just before them.
 ' In the End of *May* 1715, stopping at an Orchard, by the Road-
 ' side, to get some Cherries, being three of us in Company, we were en-
 ' tertained with a whole Process of a Charm between a *Rattle-Snake*
 ' and a *Hare*, the *Hare* being better than half grown. It happened
 ' thus: One of the Company in his Search for the best Cherries, espied
 ' the *Hare* sitting, and although he went close by her, she did not
 ' move, 'till he (not suspecting the Occasion of her Gentleness) gave
 ' her a Lash with his Whip. This made her run about ten Foot, and
 ' there sit down again. The Gentleman not finding the Cherries ripe,
 ' immediately returned the same Way, and near the Place where he
 ' struck the *Hare*, he spied a *Rattle-Snake*. Still not suspecting the
 ' Charm, he goes back about twenty Yards to a Hedge to get a Stick
 ' to kill the Snake, and at his Return found the Snake removed and
 ' coiled in the same Place from whence he had moved the *Hare*. This
 ' put him into immediate Thoughts of looking for the *Hare* again,
 ' and soon spied her about ten Foot off the Snake, in the same Place
 ' to which she had started when he whipt her. She was now lying
 ' down, but would sometimes raise herself on her Fore-feet, struggling
 ' as it were for Life, or to get away, but could never raise her hinder
 ' Parts from the Ground; and then would fall flat on her Side again,
 ' panting vehemently. In this Condition the *Hare* and Snake were
 ' when he called me; and tho' we all three came up within 15
 ' Foot of the Snake to have a full View of the whole, he took no No-
 ' tice at all of us, nor so much as gave a Glance towards us. There
 ' we stood at least half an Hour, the Snake not altering a Jot, but the
 ' *Hare* often struggling and falling on it's Side again, till at last the
 ' *Hare* lay still as dead for some Time: Then the Snake moved out
 ' of his Coil, and slid gently and smoothly on towards the *Hare*, his
 ' Colours at that Instant being ten Times more glorious and shining
 ' than at other Times. As the Snake moved along, the *Hare* hap-
 ' pened to fetch another Struggle, upon which the Snake made a Stop,
 ' lying at his Length, till the *Hare* had lain quiet again for a short
 ' Space, and then he advanced again, till he came up to the hinder
 ' Parts of the *Hare*, which in all this Operation had been towards
 ' the Snake. There he made a Survey all over the *Hare*, raising Part
 ' of his Body above it, then turned off, and went to the Head and
 ' Nose of the *Hare*, after that to the Ears, took the Ears in his Mouth
 ' one after the other, working each apart in his Mouth as a Man does
 ' a Wafer to moisten it, then returned to the Nose again, and took the
 ' Face into his Mouth, straining and gathering his Lips sometimes by
 ' one Side of his Mouth, sometimes by the other. At the Shoulders
 ' he was a long Time puzzled, often halling and stretching the *Hare*
 ' out at Length, and straining forward first one Side of his Mouth,
 ' then the other, till at last he got the whole Body into his Throat.
 ' Then

' Then we went to him, and taking the Twist-band off from my Hat,
 ' I made a Noose, and put it about his Neck. This made him at
 ' length very furious ; but we having secured him, put him into one
 ' End of a Wallet, and carried him on Horseback five Miles to Mr
 ' *John Baylor's* House, where we lodged that Night, with a Design to
 ' have sent him to Dr *Cock* at *Williamsburgh* ; but Mr *Baylor* was so care-
 ' ful of his Slaves that he would not let him be put into his Boat, for
 ' fear he should get loose and mischief them. Therefore the next Morn-
 ' ing we killed him, and took the Hare out of his Belly. The Head
 ' of the Hare began to be digested, and the Hair falling off, hav-
 ' ing lain about 18 Hours in the Snake's Belly.

' I thought this Account of such a Curiosity would be acceptable,
 ' and the rather because though I live in a Country where such things
 ' are said frequently to happen, yet I never could have any satisfactory
 ' Account of a Charm, though I have met with several Persons who
 ' have pretended to have seen them. Some also pretend that those
 ' Sort of Snakes influence Children, and even Men and Women by
 ' their Charms. But this that I have related of my own View, I aver
 ' (for the Satisfaction of the Learned) to be punctually true, without
 ' enlarging or wavering in any Respect, upon the Faith of a Christian.

' In my Youth I was a Bear-hunting in the Woods above the In-
 ' habitants ; and having straggled from my Companions, I was enter-
 ' tained at my Return with a Relation of a pleasant Rencontre be-
 ' tween a Dog and a Rattle-Snake, about a Squirrel. The Snake had
 ' got the Head and Shoulders of the Squirrel into his Mouth, which
 ' being something too large for his Throat, it took him up some time
 ' to moisten the Furr of the Squirrel with his Spawl, to make it slip
 ' down. The Dog took this Advantage, seized the hinder Parts of
 ' the Squirrel, and tugg'd with all his Might. The Snake on the
 ' other Side would not let go his Hold for a long time, till at last,
 ' fearing he might be bruised by the Dog's running away with him,
 ' he gave up his Prey to the Dog. The Dog eat the Squirrel, and
 ' felt no Harm.

' Another Curiosity concerning this Viper, which I never met with
 ' in Print, I will also relate from my own Observation.

' Some time after my Observation of the Charm, my Waiting-
 ' Boy being sent abroad on an Errand also, took upon himself to bring
 ' home a *Rattle-Snake* in a Noose. I cut off the Head of this Snake,
 ' leaving about an Inch of the Neck with it : This I laid upon the
 ' Head of a Tobacco Hogshead, one *Stephen Lankford*, a Carpenter,
 ' now alive, being with me. Now you must note, that these Snakes
 ' have but two Teeth, by which they convey their Poison ; and they
 ' are placed in the upper Jaw, pretty forward in the Mouth, one on
 ' each Side. These Teeth are hollow and crooked like a Cock's Spur :
 ' They are also loose or springing in the Mouth, and not fastened in
 ' the Jawbone as all the other Teeth are. The Hollow has a Vent

also

also through by a small Hole a little below the Point of the Tooth. These two Teeth are kept lying down along the Jaw, or shut like a Spring-knife, and don't shrink up as the Talons of a Cat or Panther: They have also over them a loose thin Film or Skin of a Flesh-Colour, which rises over them when they are raised; which I take to be only at the Will of the Snake to do Injury. This Skin does not break by the rising of the Tooth only, but keeps whole till the Bite is given, and then is pierced by the Tooth, by which the Poison is let out. The Head being laid upon the Hogshead, I took two little Twigs or Splinters of Sticks; and having turned the Head upon it's Crown, opened the Mouth, and lifted up the Fang or Springing-Tooth on one Side several Times; in doing of which I at last broke the Skin. The Head gave a sudden Champ with it's Mouth, breaking from my Sticks; in which I observed that the Poison ran down in a Lump like Oil, round the Root of the Tooth. Then I turned the other Side of the Head, and resolved to be more careful to keep the Mouth open on the like Occasion, and observe more narrowly the Consequence. For it is to be observed, that tho' the Heads of Snakes, Terrapins (*a Sort of Tortoise*) and such like Vermin be cut off, yet the Body will not die in a long Time after, the general Saying is, till the Sun sets. After opening the Mouth on the other Side, and lifting up that Fang also several Times, he endeavoured to give another Bite or Champ; but I kept his Mouth open, and the Tooth pierced the Film, and emitted a Stream like one full of Blood, in Blood-letting, and cast some Drops upon the Sleeve of the Carpenter's Shirt, who had no Waistcoat on. I advised him to pull off his Shirt, but he would not, and received no Harm; and though nothing could then be seen of it upon the Shirt, yet in washing there appeared five green Specks, which every washing appeared plainer and plainer, and lasted so long as the Shirt did, which the Carpenter told me was about three Years after. The Head we threw afterwards down upon the Ground, and a Sow came and eat it before our Faces, and received no Harm. Now I believe, had this Poison lighted upon any Place of the Carpenter's Skin, that was scratched or hurt, it might have poisoned him. I take the Poison to rest in a small Bag or Receptacle in the Hollow at the Root of these Teeth, but I never had the Opportunity afterwards to make a farther Discovery of that.

I will likewise give you a Story of the violent Effects of this Sort of Poison, because I depend on the Truth of it, having it from an Acquaintance of mine of good Credit, one Colonel *James Taylor* of *Metapony*, still alive. He being with others in the Woods a surveying, just as they were standing to light their Pipes, they found a Rattle-Snake, and cut off his Head, and about three Inches of the Body. Then with a green Stick, which he had in his Hand, about a Foot and half long, the Bark being newly peeled off, urged and

‘ provoked the Head, till it bit the Stick in Fury several Times. Up-
 ‘ on this the Colonel observed small green Streaks to rise up along the
 ‘ Stick towards his Hand. He threw the Stick upon the Ground, and
 ‘ in a quarter of an Hour, the Stick of it’s own Accord split into se-
 ‘ veral Pieces, and fell asunder from End to End. This Account I
 ‘ had from him again at the Writing hereof.’

Father *Labat* likewise tells us *, that Serpents, when they bite their Prey, retire, to avoid being hurt by them; and when dead, cover them with their Spittle, extend their Feet along their Sides and Tails, if Quadrupeds, and then swallow them.

Concerning a
 Cluster of small
 Teeth observed
 at the Root of
 each Fang or
 great Tooth
 in the Head of
 a Rattle-
 Snake, upon
 dissecting it,
 by John Bar-
 tram, M. D.
 N^o 456, p.
 358, dated
 July 17,
 1734.

2. Near *German-Town*, about six Miles from *Philadelphia*, we found a Rattle-snake, which is now become a Rarity so near our Settlements. I took it home, and dissected it: In the Head I met with what has not been observed before by any that I can remember; that is, a Cluster of Teeth on each Side the upper Jaw, at the Root of the great Fangs, thro’ which the Poison is ejected. I observed, in the same Case that the two main Teeth were sheathed in, lay four others at the Root of each Tooth, in a Cluster together, of the same Shape and Figure with the great ones, and I am apt to think for the same Use and Purposes, if by Accident the main Teeth happen to be broken, as was the Fellow to this that I send you. May not these Clusters of Teeth be placed to supply such a Defect successively, for the Support and Defence of this Creature?

Concerning the
 Viper catch-
 ers, and their
 Remedy for the
 Bite of a
 Viper, by
 William Bur-
 ton, M. D.
 at Windfor.
 N^o 445. p.
 312. dated
 M 4,
 1731.

XIII. 1. *William Oliver*, and his Wife, called upon me last Week with their *Vipers*, and either of them offered to be bit by any *Viper*, and to suffer their Arm to swell for some Time; and then, by the external Application of a common cheap Remedy, in a few Hours to remove all the Symptoms. The Experiment was made last *Wednesday* in our Town-Hall, before *Dr Derham*, F. R. S. *Dr Waterland*, the Physicians, Apothecaries, and Surgeons of this Town, and many other Gentlemen of this Neighbourhood. He was bit in the upper Joint of the Thumb, and higher up on the same Arm, by two different fresh *Vipers*: His Thumb, Hand, and Arm soon after swelled much, and all the usual Symptoms of a *Viper* Bite followed; he applied the Remedy before us, with the promised Success: But all the Contributors engaged not to divulge the Remedy.

A Narration
 of the Experi-
 ments made
 June 1, 1734.
 before several
 Members of
 the Royal So-
 ciety, and o-
 thers, on a
 Man, who
 suffered him-
 self be bit by
 a Viper, or
 common Adder;

2. *William Oliver* and his Wife, from *Bath*, who followed the Bu-
 siness of catching and selling *Vipers*, offered themselves to be bit by
 any *Viper* that should be procured, trusting to the Virtue of a Re-
 medy they had lighted on by chance in trying Variety of Things, when
 the Woman was once accidentally bitten, and the usual known Me-
 dicines, even the Oil of *Vipers*, had no Effect in asswaging her Pains,
 especially of her Breast of the same Side as the Hand in which she had
 received the Wound. This Remedy, which is only common OIL
 of OLIVES, and, from it’s Use with *Sallad*, is vulgarly known by
 the Name of *Sallad-Oil*, recommends itself not only for it’s Efficacy,

* *Nouveau Voyage aux Isles de l’Amerique*, Tom. iv. p. 96. & 106. Ed. Paris, 1722, 8vo.
 but

but likewise on account of it's being readily to be come at, when Accidents happen; there being no Town, or even Gentleman's House in the Country, where *Sallad-Oil* is not at hand; whereas the *Oil of Vipers* is never to be had, but at *Apothecaries*, and not one in an Hundred of them keep it by them.

June 1. 1734, in the Prefence of a great Number of Persons, the said *William Oliver* was bit by an old black *Viper*, or *Adder*, brought by one of the Company, upon the Wrist and Joint of the Thumb of the Right Hand, so that Drops of Blood came out of the Wounds. He said that he immediately felt a violent Pain and shooting from the Wounds, both to the Top of his Thumb and up his Arm, even before the *Viper* was loosened from his Hand; soon after he felt a Pain, resembling that of burning, trickle up his Arm; in a few Minutes his Eyes began to look red and fiery, and to water much: In less than half an Hour, he perceived the Venom seize his Heart, with a pricking Pain, which was attended with Faintness and Shortness of Breath, whereupon he fell into violent cold Sweats: In a few Minutes after this, his Belly began to swell, with great Gripings, and Pains in his Back, which were attended with violent Vomitings and Purgings. He told me, that, during the Violence of these Symptoms, his Sight was gone twice for several Minutes at a Time, but that he could hear all the while. He said, that in his former Experiments he had never deferred making use of his Remedy longer than when he perceived the Effects of the Venom reaching his Heart; but this Time, being willing to satisfy the Company thoroughly, and trusting to the speedy Effects of the *Oil*, which had never failed him, when used in Time, he forbore to apply any thing, till he found himself exceeding ill, and quite giddy.

About an Hour and Quarter after the first of his being bit, a Chafing-dish of glowing Charcoal was brought in, and his Arm, the Cloaths being stript off of it, was held over it as near, as he could bear it, while his Wife rubbed in with her Hand the *Sallad-Oil*, (which I had procured and kept myself in my Pocket, lest they should privately add any Thing to it; I bought it by the Name of *Lucca-Oil*) turning his Arm continually round, as if she would have roasted it over the Coals: He said that the Pain soon abated, but the Swelling did not diminish much; most violent Vomitings and Purgings soon ensued, and his Pulse became so low, and so often interrupted, that it was thought proper by the Physicians present, to give him the following Cordial Draughts, at about a Quarter of an Hour's Distance between each.

and on other
Animals like
wise bitten by
the same, and
other Vipers, by
Cromwell
Mortimer,
M. D. Secr.
R. S. N^o 443.
p. 313. Oct.
1736.

1. ℞. Aq. Lact. Pæon. comp. aa. ℥iij. Sp. Lavendulæ ℥i. m. pro duobus Haustibus.
2. ℞. Confect. Raleigh. ℥ss. Aq. Theriacal. ℥iss. Sp. C. C. gr. x. m. f. Haustus.
3. ℞. Confect. Raleigh. Theriac. Andromach. aa. ℥ss. Sal. C. C. gr. v. Aq. Theriacal. ℥ij. pro duobus Haustibus. He

He said he was not sensible of any great Relief from these Cordials; but that a Glass or two of *Olive-Oil* drank down, seemed to give him some Ease.

Continuing in this dangerous Condition, he was put to Bed as soon, as one could be got ready for him, where his Arm was again bathed with his Remedy over a Pan of Charcoal set by the Bed-side: But continuing to complain much of his Back and Belly, I advised his Wife to rub them likewise with *Sallad-Oil*, heated in a Ladle over the Charcoal; which she did accordingly: whereupon he declared he found immediate Ease, as tho' by some Charm; and he had not above 2 or 3 Reachings to vomit and Stools afterwards, but made Water plentifully, which was not discoloured: Then he soon fell into a sound Sleep, only was often interrupted by Persons coming to see and inquire after him, till near 12, from which Time he slept continually to 5 or 6 next Morning, when he awaked, and found himself very well: But in the Afternoon, on drinking some Rum and strong Beer, so as to be almost fuddled, the Swelling returned, with much Pain, and cold Sweats; which abated soon, on bathing the Arm as before, and wrapping it up in brown Paper soaked with *Oil*.

Two *Pigeons* were bit by the same *Viper* immediately after the Man: They soon sickened, and seemed giddy. Nothing being applied, the one died in about an Hour's Time, the other half an Hour after. The Flesh of both was turned quite black as if mortified; the Blood was coagulated, and looked black.

June 3, the Man's Arm remained swelled, looked red, marbled with Spots of Yellow, but felt soft; and he had the perfect Use of it, and even of his Fingers, no Pain or Stiffness being left. He then caused a small *Spaniel Dog* to be bit on the Nose by a fresh *Viper*: Some *Oil* was immediately applied hot, and rubbed well in, till all the Hair of his Nose was thoroughly wet: The *Dog* did not seem very uneasy; his Nose only swelled a little; he eat soon after; his Nose was bathed once more that Evening; he was found very well next Morning; but his Nose was bathed again, to make sure of his Cure: He remained perfectly well without any Symptoms ensuing, and was alive and well a Year after. Another *Pigeon* was likewise bit under the Wing at the same Time as the *Dog*, but by a fresh *Viper*; the *Oil* was immediately applied hot, and rubbed well in, and the Feathers of the Wing were thoroughly wetted with it. This Bird did not seem at all disordered with the Venom, but eat soon after, and was found well the next Morning, without any remarkable Inflammation or Swelling about the Part. The hot *Oil* was rubbed in again for 2 or 3 Days, twice a Day, and the Bird continued well, so that the *Viper-Catchers* carried it with them out of Town in Triumph, having never before experienced the Efficacy of their Remedy on so small an Animal; which, as it receives the same Quantity of Venom by a Bite as a larger one doth, is more liable to die under it; and they kept it alive above 3 Months, when they killed it and eat it. They said that they had experienced

experienced their Remedy to take Effect on Cows, Horses, and Dogs, 10 Hours after being bit; but that for themselves, who are frequently bit in the Fields, as they catch the *Vipers*, they always carry a Vial of *Sallad-Oil* along with them, that, as soon as they perceive themselves wounded, they without any Loss of Time bathe the Part with it; and if it be the Heel, they wet the Stocking thoroughly with it; if the Finger, which happens ofteneft, they pour some of it into that Finger of their Glove, which they immediately put on again, and thus never feel any farther Inconvenience from the Accident, not even so much as from the Sting of a common *Bee*. Perhaps it may be found of Use for the Bite of *Rattle-Snakes*, and other venomous Animals; especially if we consider, that in the Fields a Man seldom or never receives more than one Bite at a Time, which doth not infect him with so much Venom, as was instilled into the Man's Blood, when in these voluntary Experiments he suffered himself to be bitten twice together; and had likewise been bitten 3 times but about a Week or 10 Days before; some Remains of which Venom, it is highly reasonable to imagine, might still infect his Blood at the Time he repeated the Experiments, so as to make a fresh Quantity of the Venom operate with greater Violence upon his Body, than if he had been quite a fresh Man, never infected with the like Poison before, or at least at so great an Interval of Time, that his Blood might have been entirely free from all Remains of such an acrid Infection. From these Experiments is it not reasonable to imagine, that the *Oil* by itself may be as efficacious against the Sting of a *Scorpion*, as if *Scorpions* were infused in it?

3. The Man who was lately bitten by a *Viper* in the Presence of several Members of the *Royal Society*, having been recommended to some in this Place by Dr *Oliver* of the *Bath*, the following Experiments were made here. July 3d, the Man was bit in the Presence of several besides myself, in the public Hall of this College. He received two Punctures in the Wrist, a little above the Thumb: The Blood issued, and more Venom lay upon the Orifices, than could be immediately imbibed. The Man complained in about half an Hour's Time, that the Poison was got up to his Shoulder, and entering his Body; but notwithstanding this, we did not suffer him to apply his Medicine till an Hour and ten Minutes after he was bitten: by which Time he began to be flushed and in a Sweat, his Hand swollen and discoloured. Upon an Application of his Medicine, he found some Abatement of his Pain; but the Swelling appeared more visible, and spread itself farther into his Arm. In about a quarter of an Hour the Man sunk under the Table, and complained of violent Pains in his Back and Bowels, nor could he bear to be moved. At last, his Pulse failing, his Jaw being fallen, his Countenance changed, and Eyes fixed, we stretched him upon the Table, and applied the Medicine to his Belly and Stomach. Soon after which, recovering a little, he began to vomit, and brought up more than a Quart of Phlegm and Bile. In this

Observations on a Man and Woman bit by Vipers, by Joseph Atwell, D. D. F. R. S. and Principal of Exeter College, Oxford. N^o. 444. p. 394. dated, July 24. 1734.

this Condition he lay for more than an Hour; and then was removed into my Lodgings; where he was seized again with a Fit of vomiting, and likewise purging, and continued so till Midnight. I kept him in my own House above an Hour, in Hopes of his growing better; but his Disorder still continuing, and the Man being too weak and feeble even to stand, I sent him in a Chair home to his own Lodgings; where he was put into Bed, and after Midnight fell asleep, and awaked the next Morning perfectly well; excepting that his Arm was still swoln, and the Flesh pitted, as if it had been dropsical. His Arm was bound up in Papers, dipt in his own Medicine; and this was all, as far as I could observe or learn, that was applied to it. The same Day we caused 2 young Chickens to be bit; one died in 2 Hours, and the other in 4 Hours Time. A Third was bit 3 times, and then had the Medicine applied; but it died at the End of 10 Hours. The Flesh of this last was grown very black, and there was much extravasated Lymph between it and the Skin, which stunk insufferably; but I could not perceive, that the Viscera were at all discoloured.

July 4th, We had another Fowl, half grown, bit in two Places, and the Medicine was applied: Half an Hour after which, the Fowl eat Meat, and seemed much recovered, but was dead in 14 Hours Time.

July 6th, We caused two half-grown Cocks to be bit; the first was bit but once, yet violently, and turned black immediately; it had the Medicine applied, eat Meat afterwards, and seemed pretty well; yet died in twenty Hours. The other was bit 2 or 3 times, but hardly wounded, and not half so much discoloured as the former: We bathed the Wound with *Viper-Oil*, but the Fowl died in a little more than 2 Hours. July 8th, We caused 2 young Pigeons to be bit; the one had *Viper-Oil* applied immediately, but sickened and died in 4 Hours: The other had *Olive-Oil* applied, and recovered perfectly; the Flesh beginning to return to it's natural Colour in about an Hour's Time.

July 17th, The Woman was bit in the publick Hall of *Brazen-Nose-College*, in Presence of Dr *Frampton*, Dr *Frewin*, and several other Physicians, myself, and many others. It had been suspected, that they played some Tricks with their *Vipers*, and made them spend their Rage and Venom beforehand: To obviate which, a Physician of the Company had provided some fresh *Vipers*, which he had caught himself a Day or two before, and kept in his own Custody till that Time. The Woman was bit twice by one of these and received 3 Wounds, one in the Thumb and 2 in the Fore-finger. Her Hand was soon swoln and spotted, and her Finger turned black. After 23 Minutes, she applied the Medicine to her Hand, but not farther than the Swelling went; in which, I think, she was to be blamed, and I suspect the following Illness was in some Measure occasioned by it. She walked home very well in Appearance: But about 3 Hours after the Bite was received, she grew very sick, and in great Pain; was seized with Vomiting, Purging, and Fainting-fits, which continued upon her all Night, inso-

much that the People of the House despaired of her Life : Nor had she any Sleep till Noon the Day following. I saw her about 6 that Evening, when she awaked, and found her very well in Spirits, but complaining of most acute Pains in her Finger. Her Arm, Shoulder, Back, and Breast, on that Side, were much swoln and inflamed : All those Parts thus affected were bound up in Papers soaked in the Medicine. After this there appeared upon her Finger two large Bladders, full of a black corrupt Matter ; and this not only upon the Wound, but one of them was upon a distant Part of the Finger from it. She could not be persuaded to open them, which I believe would have eased her considerably. *July 20th*, the Swelling was considerably abated, and almost reduced entirely into her Hand, which begun to pit : But she complained still of her Finger, and could hardly endure to have it dressed with fresh Papers. She continued in Bed till the 22d, for the Sake of keeping her Hand in a more easy Posture ; and then came abroad. The same Day that the Woman was bit, we caused a Fowl to be bit ; but the Wound was not deep, and little more than a Scratch. Nothing was applied to it, and it died in 20 Hours. A large Puppy was bit the same Day 3 times in the Head, had the Medicine applied, but died in about an Hour. It was known that these People kept themselves fasting those Days when the Experiment was to be tried upon them : This occasioned a Suspicion that they might take some Antidote to prepare their Bodies : For which Reason, I ordered the Man to bring me some Vipers after Dinner, last *Monday*, under Pretence of making some farther Experiments upon Dogs. We had provided at the same Time some fresh Vipers without his Knowledge, and then proposed to him to be bit by one of them, and apply his Medicine immediately. His Hand was besmeared with the Medicine in applying it to a young Dog, upon which we had just made an Experiment. Two Vipers were tried upon the Man, but neither would bite him : One of them attempted it several times, and spilt his Venom, but always caught back his Head again, as if there had been something in the Hand offensive. Upon this, suspecting that the Smell of the Medicine might occasion it, we made him wash his Hand, after which another Viper bit him immediately : But whether our Conjecture was right or not, must depend upon farther Trial. The Man received the Bite upon the Joint of the Thumb, and the Blood issued at the two Orifices. He applied the Medicine instantly : The Thumb appeared black soon, the Hand was swoln, and the Flesh pitted instantly. He drank a Mug of Ale after it, and then went home to Bed. Yesterday Morning, his whole Arm was swoln, but the Man was so well that he went 6 Miles out of Town, and came home again in the Evening. I have seen him again this Morning ; the Swelling is almost gone above the Elbow, but the Flesh pits below : The Wound has blistered, but the Bladders were filled with a Water, and not any thing of that black Matter which appeared upon the Woman's Finger. We caused a young Dog (men-

tioned before) to be bit the same Day, and applied the Medicine. Another Dog was 3 times bit in the Nose, and nothing applied: Both are much swoln, but very likely to live. We likewise thrust the Teeth of a Viper's Head cut off 24 Hours before, into the Flesh of a Fowl, which turned black immediately, but the Fowl is perfectly recovered without any Application.

Concerning the
Viper Catch-
ers, and the
Efficacy of Oil
of Olives in
curing the Bite
of Vipers, by
Stephen Wil-
liams, M. B.
F.R.S. No.
445. p. 26.
Jan. &c.
1737.

4. *William Oliver*, in Presence of several Gentlemen of the Faculty of Physick, suffered himself, on *June 26, 1735*, to be bit by a Female Viper; which being enraged, fixed her Fangs in the middle Part of his Fore-finger. Blood soon issued out at the Wounds: But that the Poison might more strongly appear, the same Viper immediately bit a Pigeon in the Breast, which expired in less than half an hour. Another Pigeon was also bit by the same Viper, which expired also, though not so soon as the first. Mr *Oliver* immediately complained of an acute Pain in the wounded Part. It soon looked red, then became of a livid Colour: His Finger swelled to a great Size, and he could not bend it. Soon upon this his Hand also began to swell: He complained of Faintness, and Pains flying to his Arm, Shoulder, and Arm-pit. In half an Hour's Time from the Bite, we persuaded him to try his Specifick; which being applied, and strongly rubbed into the Part affected, procured him immediate Ease. His Pain lessened, his Finger became flexible, his Spirits seemed more chearful: The Specifick being several times repeated and applied, his Pains gradually diminished. The next Day, *June 27*, his Finger and Hand remained tumefied, but without Pain: The Skin began to appear yellow, and Pustles appeared, like Bladders, on his Finger; which being pricked, emitted a sanious Liquor. In two Days time all his Symptoms vanished, and he became perfectly well.

June 30, the Gentlemen of the Faculty met again, when we tried several Experiments on Puppies, Cats, and Pigeons; wherein we found the Efficacy of Mr *Oliver's* Specifick, and gave the Company great Satisfaction.

An Abstract
of an Inaugu-
ral Disserta-
tion published
at Wittem-
berg, 1736,
by Dr Abra-
ham Vater,
F. R. S. con-
cerning the
Bite of a Vi-
per, cured by
Sallad Oil,
by C. Morti-
mer, M. D.
Secr. R. S.
No. 451. p.
440, Dec.
1738.

5. This Tract is intituled, *Dissertatio Inaug. Medica, de Antidoto novo adversus Viperarum morsum præstantissimo in Anglia haud ita pridem detecto, quam præside Dn. Abr. Vatero pro gradu Doctoris ventilandam proponit Fridericus Genslerus Gedanensis, Sept. 11. 1736. Vitembergæ, in 4to.*

Our Author was first informed of the Use of Oil of Olives against the Bite of Vipers by a Letter written to him by Sir *Conrad Sprengell*, Anno 1734, wherein he gives him an Account of the above Experiments: He had communicated the Contents of this Letter to Dr *Vater* at *Dresden*, who had an Opportunity of trying the Efficacy of this Remedy, by an Accident happening in that City; which Case being remarkable, he hath related it at large in the abovementioned Dissertation, and is as follows:

The head Journeyman in the Royal Dispensary at *Dresden*, being the last Year preparing some *Italian Vipers* for a Patient of Distinction,

tion, was, through Negligence, bitten by one of them in one of his Fingers. The Man finding himself wounded, was mightily frightened, and immediately fell to turning over Physic Books, in order to find out a Remedy, whereby he might ward off the Danger which he was sensible hung over him. But he found little Comfort in those Books; on the contrary, he was grieved in the highest Manner, upon reading in one of them, that Wounds from Vipers are commonly deadly, and that there remains very little help to be given. Being in these Streights, he tried various things; among others he applied *Theriaca* outwardly to the Wound, but felt no Relief from it, and in the Space of a few Hours, his whole Arm swelling to an enormous Degree, he felt great Pain in it, with remarkable Tensions under his Arm-pit towards his Heart, attended with a Faintness. Therefore, almost despairing of Recovery, having tried all things in vain, he went to Dr *Vater*, and asked his Assistance. He having been informed of the Virtue of Olive-Oil in this Case, as I have before mentioned, ordered the Man to anoint his whole Arm therewith hot, and several times, upon which the desired Effect soon followed: For the Arm, after one or two Anointings, began to grow less; the Pains, with the other Symptoms, were assuaged, and gradually ceased, and the Patient recovered perfectly in a Day or two. He took nothing inwardly besides a simple Mixture * with an anodyne mineral Liquor, by the Advice of my Cousin, whereupon a copious Sweat ensued, which sensibly relieved the Patient. We do not disown but that this Medicine contributed greatly to the Cure, although the chief Part in this Affair is to be ascribed to the *Oil of Olives*, because upon anointing therewith, the Symptoms abated instantly. I had this whole Case from the Mouth of the Man himself, who was bitten, and thus cured.

I shall pass over what our Author saith concerning the Nature and different Species of Vipers; concerning the Effects of the Bite of Vipers on Men and Brutes; his Examination of the Venom of Vipers; the *Phænomena* observed upon opening Brutes killed by the Bite of Vipers; the Cure of these Bites by the Application of external Remedies, and by giving Antidotes internally; the two famous Antidotes, the *Mungos-root*, and the *Serpentine-stone*, called the Magnet of Poisons; as being only Collections from Authors, and containing nothing new. But speaking of the *Serpentine* or *Viper-stone*, he relates a very extraordinary Accident, if true, from *Kempfer's Amenit.* p. 579. The Case was this: In the House of a *Dutch* Governor on the Coast of *Choromandel*, a Servant Maid happened to be bit in the Foot by a *Cobra Cabelo*. The *Serpentine-stone* was immediately laid on, which falling off, and no other being to be had, nor any new Milk being at hand to wash out the Pores of the Stone in, a wet Nurse being in the House, who was anxious for the sudden Effects of the Poison, milked

* *Sp. Vitriol. dulcis. Sp. Vitriol. p. i. Sp. V. p. iii.*

some Milk upon the Stone out of her own Breasts; whereupon her Nipple began immediately to be painful, and soon after the whole Breast of that Side swelled, and was inflamed, even to the Hazard of her Life for 3 Days together, and the Hardness did not leave her Breast in less than 10 Days. It must be remarked, that her Nipple was before somewhat excoriated by the Gums of her Nursling, whereby the small Veins being laid bare, it was readier to receive the Infection of the Venom rendered more active by the Warmth of the Milk.

When he comes to speak of *Oil of Olives* in particular, and its Effects against Poison in general, he cites a remarkable Passage from *Matthiolus* *: Where he says, I have found by Experience, that Oil prepared by myself, into which a great Number of *Scorpions* had been put, being anointed on the Heart, and where the Pulsations of the Arteries of the Hands and Feet are felt, frees from all Poisons; nay, it likewise cures those who have been bit by *Vipers*, or stung by any other venomous Animals. Our Author, comparing this with the Virtue of the Oil alone, for the Bite of a *Viper*, concludes, that the *Scorpions* infused in it, add nothing to its real Virtue.

He concludes this Dissertation, by endeavouring to explain the Manner of its operating, which he attributes to its fat inviscating Nature, whereby it sheathes the Spicula of the Poison. He remarks, that *Celsus* †, advises, after dipping a Person in an *Hydrophobia* in cold Water, to put him into warm Oil. Last of all he mentions the great Secret of the *Viper-Catchers*, that is, the Fat of *Vipers*: which, he thinks, acts in the same manner as the *Olive-Oil*.

Concerning the
Efficacy of Oil
of Olives in
curing the Bite
of Vipers, by
M. Dufay, at
Paris, dated
Aug. 8. 1737.
Translated
from the
French, by
T. S. M. D.
Ibid. p. 444.

6. After I had given the Academy an Account of your Observations on the Remedy against the Bite of *Vipers*, a Committee was appointed to make the same Experiments here. But whether it be, that our *Vipers* are more venomous than yours, or that the Bites were more considerable, of the several Pigeons and Fowls that were bit, not one recovered, though they were immediately rubbed with Oil. They died in a Quarter of an Hour, or in an Hour's time at farthest. The like Experiments have been made on several other Animals; but as the Gentlemen are resolved to repeat them, I do not send you an Account of them. All I can say at present is, that the Remedy seems to be not so sure here as in *England*, where I find by the publick News-papers, that a *Rattlesnake* has been lately brought, and that its Bite has been cured by the same Remedy.

—By the same,
dated at Paris,
Dec. 11.
1737. *Ibid.*
p. 445.

7. Two Members of the Academy have been employed to make the Experiments relating to the Cure of the Bite of *Vipers*, and they have accordingly made some upon Dogs, Cats, Pigeons, Chickens, Ducks, and Turkeys; some of which have been cured, but some

* *Comment. in Dioscor. Lib. ii. p. 232.*

† *Lib. 5. c. 27.*

others died notwithstanding this Remedy ; and there were even some that did not die, though they were bit very deep, and yet no Application of Oil was made. This is the Report they have made us of these Experiments ; and they are determined to make new ones. All that can be thought concerning the Difference of the Success of this Remedy at *London* and at *Paris*, as it seems to me, is, that all *Vipers* are not equally venomous ; that all Bites are not perhaps equally easy to be cured ; and, in a word, that the *Vipers* in *France* are more dangerous than those in *England*. Finally, the Sequel of these Experiments will probably teach us, in what Cases this Remedy may be applied in this Country, *France*.

XIV. Having procured one of the lightest Colour, and most transparent, I put it into a glass Tube, of a Bore just big enough to receive it ; the smaller the Tube, the better, provided you can get it in without injuring it. When I had fixed the Tube in the Body of the Microscope, I found the exact *Focus*, before I placed the Microscope on the Tube which receives and conveys the Sun's Rays to the Animal ; and, having darkened the Room as much as I possibly could, I had a most entertaining Sight of it on my Paper Screen, at the Distance of 3 and 4 Feet. The Magnifier I used was the 4th in *Wilson's* Pocket Microscope. And at the Distance of 6 or 7 Feet, but not so distinct. — You have in Fig. 40 the exact Dimensions of the Field of Vision (as I call it), taken with a black Lead Pencil, on the Sheet of Paper which was strained in a Frame on purpose, at the Distance of about $3\frac{1}{2}$ Feet from the *Focus*. You have there the true Dimensions of one of the larger Vessels, not the largest, which, being near the Middle of the Tail, appeared but obscure. And I have added the Dimensions of one, the Screen being removed to 6 or 7 Feet Distance.

In the larger Vessels, the Motion seems to equal that of the Stream of Water which is forced out of a Vessel by condensed Air ; and makes an Appearance not altogether unlike it, when the Fountain is placed in the Sun : Here you can discern no Shape or Form at all of the Globules, but they seem all confounded : As the Current proceeds, you have beautiful luminous Reflexions continually. But in the lesser Vessels, and in the Parts most free from Spots, I several times saw the Globules of an oblong Form, resembling *Emmets Eggs* in Shape, which I have endeavoured to represent ; gliding along one after another, and often at the Distance you see them in the Figure, sometimes joined together ; but I have never yet been able to discern any Commixture of them. I do not remember ever to have seen the Globules to approach this Form, in viewing the Circulation in the common way ; but here every thing is magnified to that Degree, that the least Departure from the globular Form appears plainly. Another thing I observed, more than once, with Pleasure ; that the Globules would, in some Places, gradually slacken their Motion, at length seem

Remarks concerning the Circulation of the Blood, as seen in the Tail of a Water-Eft, through a Solar Microscope, by the Rev. Mr Henry Miles. No. 460. p. 725. April &c. 1741.

Fig. 40.

seem to be about to stand still; in an Instant, a Globule would be compressed, in the Manner I have endeavoured to describe it; and then, as if it had squeezed through a narrow Passage, resume it's former Shape, and pass on with great Swiftnes.

But the most remarkable *Phænomenon* of all was, the Shape and odd Motion of some of them, near the Extremity of the Edge of the Tail which exactly resembled the *Tadpole* in Figure and Motion too, abating that they had not quite so much of the wriggling Motion of the Tail of those Creatures in a Pond of Water; but the Head (as I call it, for Distinction-sake) had exactly the same Motion. They seemed to be roaming about, as if in Quest of somewhat; would turn to the Right and Left, and sometimes seem to be repulsed a little, or to draw back of themselves, as I have seen the *Animalcula* in *Pepper-water* do. I have endeavoured to describe the Figure of them; the Motion has all the Resemblance that can be of that of the Animals mentioned. I began to suspect at first, they might be *Animalcula*, contained in the Water out of which the *Water-Est* came, which might remain in the Tube, under the Tail: But, on Examination, I found it dry; for indeed the Creature had been out of Water half an Hour, or more, and had been handled (which I scruple not to do), and so was drained well; so that I am certain the Appearance was in the Vessels of the Creature, though I would not be so rash as to suggest they were real *Animalcula*; for I presume the Figure and Motion may be accounted for, without supposing them to be any other than Globules of Blood, from the State in which the Blood might be, and from some Alteration of the State of the Vessel itself: The Blood, indeed, seemed to be about stagnating. It came into my Head, that I had seen a Drop of Water proceed somewhat like it, in it's Descent on a smooth dry Surface (as a glass Plate held nearly perpendicular); and, on Trial, I found the Drop to proceed in a kind of *Meatus*, not altogether unlike the Motion of the said Globules. In the Course of the Blood from *A* to *B*, sometimes a Current would turn off to the Branch at α , for a good while together, then cease to do so, passing on to *B*; and leaving the Branch α empty; and then again you might see it fill the Branch again: This I saw successively several Minutes together.

Fig. 41.

At first it was no easy Matter to make a Creature, coming out of so cold an Element, bear even the *reflected* Rays of the Sun, when converged though far enough from the *Focus*; for I was obliged to make use of a Looking-glass because of the Sun's Position: I once, indeed, tried to perform it without, but found the direct Rays too hot; but a Glance or two I had of it, convince me it might be seen to much greater Perfection. Another Difficulty is, that the Tube is rather too thick, and besides is apt to be smeared with the Tail of the Animal: However, it requires Time and Patience to perform it; yet, in the Manner I have seen it, it is to me the most entertaining Sight my Eyes ever

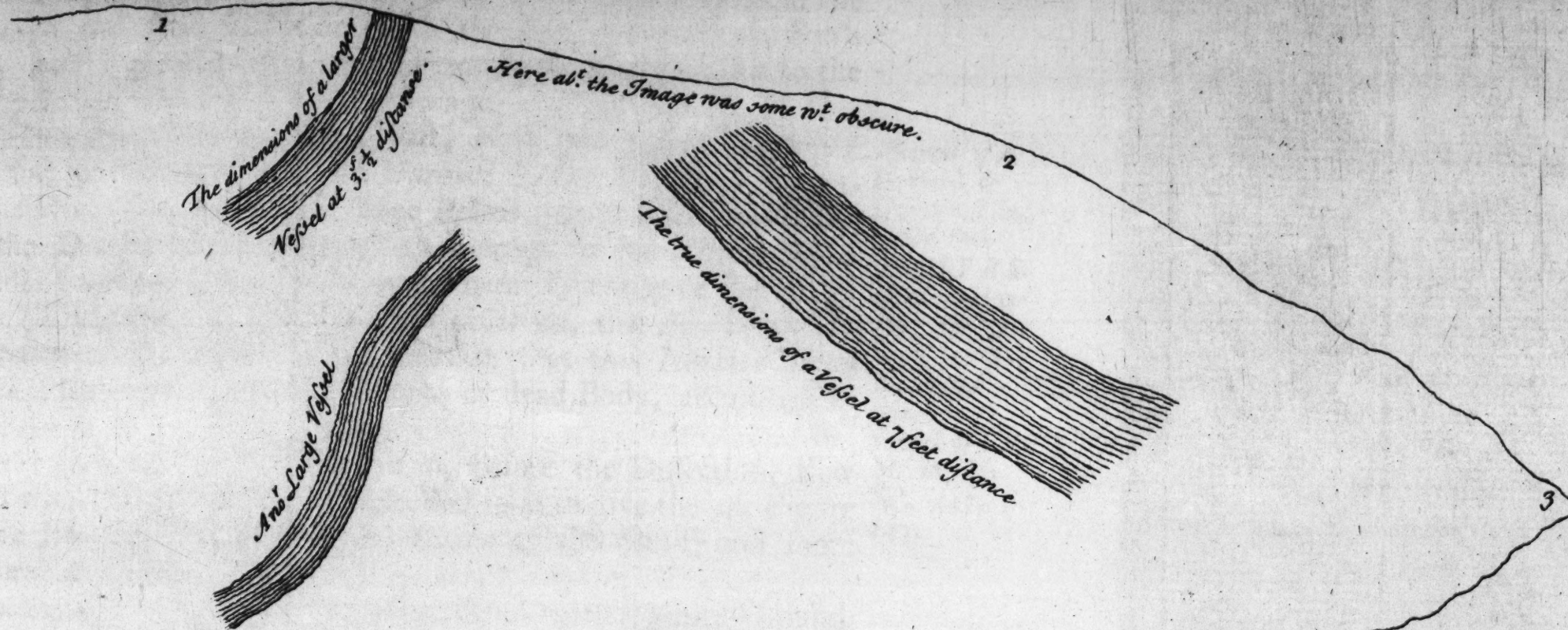


Fig. 40.

The figure of y Globules.

And figure United.

Globules compress'd.

Globules of a Tadpole form.

4

The curld Edge of y Tail.

1. 2. 3. 4. 5. The limits of y Field

5



Fig. 41.

Fig. 39.

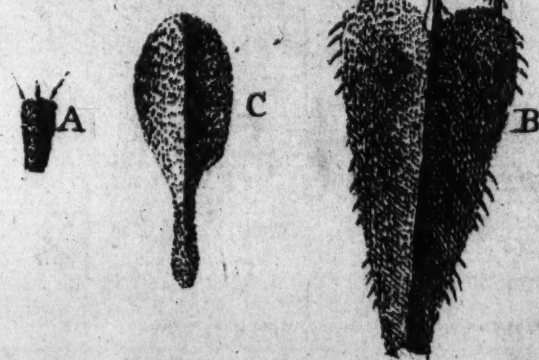


Fig. 38. α

ever saw. I am not without Hopes, that I shall be able to remove some of the Difficulties this Summer.

I forgot to mention, that the Blood appeared a little discoloured, but not more in Proportion than it appears to be when you view it in the common way; and that the Tube, with the *Lens* receiving the Sun's Rays, was exactly parallel with the Horizon, and perpendicular to the Plane of the Screen which received the Image.

XV. ¹. Towards the End of Jan. last, N. S. we had the Curiosity to catch a sort of Whale called the *Narbual* or *Sea Unicorn*. It was taken in the River *Ost*, near the Village *Bellum*, where it falls into the *Elbe*, (in the Dutchy of *Bremen*, which belongs to our Monarch) 4 German Miles from the Sea. They took a great Quantity of Fat out of it, to make (Thrann or) Whale-Oil; but observed, that this Train-Oil was of a Stench almost intolerable, by reason that this *Narbual* feeds on Carcasses: For *Nar* signifies a Carcass or dead Body, according to *Valentini* *.

Account of a
Narbual or
Unicorn Fish,
by Dr. Stei-
gertahl, F.R.S.
dated at Han-
over Apr. 20.
O. S. 1736.
Translated
from the
French by T.S.
M. D. &c.
N^o. 447. P.
147.

There was such Care taken of the Skin, before the Dissection, that it was cured with Salt and Alum, and stuffed so as to give the just Figure of the Fish: Having left with it the Bones of the Skull, and some Vertebrae near the Tail.

The Skin was spotted with dark brown Spots upon a white Ground. The Epidermis was transparent, and under it was another Skin very thin and spotted; but the true Skin was brown, and near an Inch in Thickness. On the Top of the Head they only found a semilunar Hole, as in the Porpoise, according to the Description given by *John Daniel Major* †. This Hole opens into the two Canals which run through the Skull to the Palate, and are called by *Major*, *Ductus hydragogi*. They did not remark in the Skin any Opening or Outlet for the Excrements; and I have been told, that this *Narbual* voided them through this Hole on the Top of the Head.

Concerning the Horn, I agree in Opinion with *Wormius* and others who take it for a Tooth; but I cannot believe that it's sole Use is to break the Ice: It rather serves the Fish for seeking it's Food. A Captain of a *Greenland* Vessel has assured me, that being upon the Coast a Whale-fishing, and having taken one, as he was turning the Whale to get at the Fat, he found on the opposite Side to him, a *Narbual*, that had stuck this Tooth into the Whale's Belly, up to it's Mouth, and had sucked the Blood and Humors.

I am sorry I have not an exact Account to send you of every Particular that was observed in the Dissection of this *Narbual*; for I have only seen the stuffed Skin, and consequently the outward Shape, as it was carrying to *Leipsic* Fair, and on the way shewn here at *Hanover*. And

* *Museum Museorum*, Lib. III. c. 30.

† *Miscell. Academ. Nat. Curios. Dec. 1. An. 3. p. 22. &c. seqq.*

as I find that the Figure engraved and printed at *Hamburg*, has a good Likeness to what I have seen, I have hereto annexed a Print of it.

Fig. 42.

EXPLANATION of the PRINT.

1. A Semilunar Hole, through which the Fish cast out Water and Blood, upon dying.
2. A small Rising on the Middle of the Back, and fleshy as the Fins.
3. The Mouth very little, without Teeth in the upper Jaw, except this *Dens prominens*, or Tusk; which has by some been taken for a Horn: And there was no lower Jaw found.
4. The Eye, very small.
5. The Fin on the right Side, which, as well as the opposite, is fleshy.
6. The Tail fleshy, like the Fins; which, taken according to it's Width, is not vertical, but horizontal.
7. The prominent Tooth or Tusk, generally taken for a Horn. The Length of this *Narhual* from N^o. 3 to 6, was measured, and found to be 17 Feet 9 Inches. The Tooth 6 Feet 3 Inches. The greatest Thickness, measured round, was 14 Feet. The Skin was smooth, without Scales, like that of an Eel; and was white marked with blackish Spots.

A Description of the same Narhual, communicated by John Henry, Hampe, M.D. F.R.S. Ibid p. 149. Jan. &c. 1738.

2. In a Creek called the *Belubmer Wadt*, belonging to the Bailiwick of *Newhaus* in the Dutchy of *Bremen*, hath been caught alive, an unknown Fish of a large Size, 18 to 20 Feet in Length, and four in Diameter. He hath on the Fore-part of the Head, just above the Mouth, which is very small, a Horn 6 Feet long, white like Ivory, and curiously twisted. The Body is white, sprinkled with black Spots, and smooth like an Eel. The Head is, in Proportion to the Body, very small, about 16 Inches in Length, and the same in Diameter. The Eyes are also small, about the Bigness of a Sixpence. On the upper part of the Head, is a Hole about three Inches in Diameter, out of which probably he spouts Water, like the Whales. On each Side of the Neck are placed two black Fins, one above another, and at a small Distance from one another. They are half an Inch in Thickness, of one Hand's Breadth, and two Feet in Length, round on the Fore-part all fleshy, and of a Liver-colour.

An Account of the horn of a Fish struck several Inches into the side of a Ship, by C. Mortimer, M.D. R.S. Sec. N^o. 461. p. 862. Aug. &c. 1741.

XVI. Mr *Bankley* shewed me the *Horn* of a *Fish* that had penetrated above 8 Inches into the Timber of a Ship, and gave me the following Relation of it: 'His MAJESTY'S Ship *Leopard*, having been at the *West-Indies*, and on the Coast of *Guiney*, was ordered by Warrant from the Honourable *Navy-Board*, dated *Aug. 18. 1725.* to be cleaned and refitted at *Portsmouth* for Channel-Service: Pursuant thereto, she was put into the great Stone-dock; and, in stripping off her Sheathing, the Shipwrights found something that was uncommon in her Bottom, about

about 8 Feet from her Keel, just before the Fore-mast; which they searching into, found the Bone or Part of the Horn of a Fish of the Figure here described; the Outside rough, not unlike *Seal-Skin*; and the End, where it was broken off, shewed itself like coarse Ivory, The Fish is supposed to have followed the Ship, when under Sail, because the sharp End of the Horn pointed toward the Bow: It penetrated with that Swiftneſs or Strength, that it went through the Sheathing 1 Inch thick, the Plank 3 Inches thick, and into the Timber 4 $\frac{1}{2}$ Inches.

Fig. 43.

With what prodigious Force muſt this Fiſh have moved? For had it met the Ship, the Motion of the Ship would have aſſiſted the Penetration of the Horn; but the Direction of it pointing from the Stern towards the Head, ſhews that the Fiſh ſtruck againſt the Ship, either while at Anchor; or that it overtook it, while under Sail; in which caſe the Force of the Fiſh muſt have been ſtill greater; and this was probably the Caſe, becauſe nobody in the Ship remembered the Shock. Several able Workmen on the Spot aſſured me, that, with a Hammer of a Quarter of an hundred Weight, they could not drive in a Pin of Iron, of the ſame Form and Size, into ſuch ſort of Wood, and to the ſame Depth, in leſs than 8 or 9 Strokes.

XVII. There was brought to *Plymouth*, June 29, 1734, ſtruck the Day before in the River, a *Sun-Fiſh* weighing about 500 Pound Weight. The Form of it nearly answers that given by Mr *Willoughby*, except that the Tail of this was ſcolloped.

This Fiſh differed very much in one thing from that deſcribed by Mr *Willoughby*, whoſe Fleſh, he ſays, was very ſoft: On the contrary, the Fleſh of this was hard and firm, rather a griſtly Subſtance than ſoft Fleſh.

A Gentleman of my Acquaintance, Commander of a Veſſel, tells me, his People took a *Sun-Fiſh*, South of *Newfoundland*, which, by his Deſcription, was conſiderably larger than that brought hither. They made no Uſe of the Fleſh; but he remembers it was a griſtly Subſtance, hard and firm.

A Piece of the Fleſh boiled, to try how it would look and taſte, to our Surprize, was all turned into a Gelly. Being ſoft and tender, it could not be taken out of the Saucepan with a Fork, but only with a Spoon; in Colour and Conſiſtence nearly reſembling boiled Starch when cold. It had little or nothing of the fiſhy, but a grateful and pleaſant Taſte.

By the ſticking together of my Lips, and from what I obſerved by touching it with my Fingers, I took Notice, that this boiled Fleſh was clammy and glutinous; which brought to my Mind, that what the Antients made uſe of to ſerve the Purpoſes of Glue, was made from Fiſh. I then tried it upon Paper and Leather, and found it to answer the Uſe of Paſte very well: And it was owing in part to Neglect, and partly to Accident, that it was not alſo tried upon Wood.

Concerning the Mola Salu, or Sun-Fiſh, and Glue made of it; communicated by the Rev. Mr William Barlow, No. 456. P. 343. Jan. &c. 1740.

From this Discovery of the glutinous Nature of the Flesh of the *Sun-Fish*, I would recommend it to those who have Opportunity to make farther Experiments upon it ; and probably something useful, or curious at least, may be a satisfactory Reward for the Trouble they shall give themselves on that Account.

From the Descriptions given us of the *Ichthyocolla* by *Dioscorides* and *Pliny*, the Glue-Fish seems not to be the same as our *Sun-Fish*. Whether the Fish from which our Isinglass is made, be the same as the *Ichthyocolla* of the forementioned Authors, as the Name usually given to it seems to import, I cannot tell : But neither the *Ichthyocolla* of *Rondeletius* or *Bellonius*, nor the *Huso* taken in the *Danube*, from the Bladder of which Fish-glue is made, can, by the Descriptions given of them, be the same as the *Sun-Fish*.

Some Account
of the Phoca,
Vitulus mari-
nus, or Sea-
calf, by James
Parsons, M.D.
F. R. S. No.
469. p. 383.
Read Feb. 17,
1742-3.

XVIII. The Figures given by *Aldrovandus*, *Johnston*, and others, (being Profils) lead us into two Errors : 1st, They make a Cubit in the Fore-limb, which is not visible in any Shape, from the Surface of the Body ; and, 2^{dly}, make the posterior Parts terminate in two Fins, which on the contrary are actually webbed Feet (like those of Water-Fowl) consisting of five Toes, each having three Articulations, and ending with Nails of a darkish Colour.

The Nails of the Fore-paws are very considerable, being like the Paws of a Mole, contrived for crawling upon Land, and partly for swimming, by a narrower Web between each Toe ; but the hinder Feet are extensive Webs, serving alone to drive or row the Creature in the Waters.

Rondeletius, as cited by *Gesner*, blames *Aristotle* for saying this Animal has Nails ; which is strange, as that Historian is one of great Reputation ; for it has very considerable ones.

The Animal, which was a Female, died Yesterday Morning, and the *Viscera* were as follows :

The Stomachs, Intestines, Bladder, Kidneys, Ureters, *Diaphragm*, Lungs, great Blood-Vessels, and *Pudenda*, were like those of a Cow. The Hairs of the Whiskers are very horny and clear. The Spleen was 2 Feet long, 4 Inches broad, and very thin. The Liver consisted of 6 Lobes, each hanging as long and lank as the Spleen, with a very small Gall-Bladder. The Heart was long and flabby in it's Contexture in general ; having a large *Foramen Ovale*, and very great *Columnæ carnosæ*.

In the lower Stomach were about 4 Pounds Weight of flinty Pebbles, sharp and angular, as if the Animal chose them of that Form for cutting the Food. I believe this may be common to all the larger Sea-Animals, as they swallow many considerable Fishes whole, that after some Maceration in the first Stomach, they may be more easily ground small by these Pebbles in the other, for the Nourishment of the Creature.

The

The *Uterus* is of the horned Kind, each *Cornu* being considerably thicker than the Body or Duct leading to them: It is very fibrous, and the Fibres seem all longitudinal with the *Uterus* and *Cornua*, making a muscular Appearance. The *Ovaria* are very large, being granulated on the Surface with the *Ova*, under a very thin Membrane; and the Opening into the Tubes leading to the *Cornua* is a great Hole. I have annexed a Drawing of this Part, as it is very particular.

The Authors necessary to be read upon this Animal, are *Aristotle*, *Pliny*, *Aldrovandus*, *Rondeletius*, *Gesner*, *Wolfgangius*, *Johnston*.

As to the particular Figures of the Animal, that of *Aldrovandus* seems to have been taken from a stuffed Skin, having the hinder Feet like a Fish-Tail, and not at all like the Creature. *Rondeletius*'s Figure has as little Truth as the former; and that given by *Gesner* in his Corollary on *Rondeletius*, is worse than any; having the Fore-parts upright like a *Sphinx*. This last Author has another Figure of the *Phoca*, which is rather like a *Lump fish*, and almost triangular: These could never convey a just Idea of the Creature to such as delight in Natural History, which, I hope, I have made some amends for in my Figure, having taken it from the living Animal with the utmost Care, and which is thought perfectly like the Creature by all who have seen both.

The Animal is viviparous, and suckles it's young by the *Mamilla*, like Quadrupeds, and it's Flesh is carnos and muscular. This was very young, though $7\frac{1}{2}$ Feet in Length, having scarce any Teeth, and having 4 Holes regularly placed about the Navel, as appears by the Figure, which in time become *Papillæ*.

Fig. 44. Represents the *Phoca* lying upon the Right Side, that the Fig. 44.
Belly and Parts of Generation may be the better observed. A. The Fore-feet and Breast. B. The *Umbilicus* and Holes of the *Mammæ*. C. The external Orifice of the *Vagina*, and the *Anus*. D. The hinder Feet, which are webbed. E. The Tail.

Fig. 45. Shews the *Uterus* taken out and extended. A. The Body Fig. 45.
of the *Uterus* or *Vagina*. B. The *Cornua Uteri*. C. The Holes leading into the slender Tubes that end in the Extremities of the *Cornua*. D. The *Ovaria*. E. The Continuations of the *Peritonæum*.

XIX. There are requisite for this Purpose, a Pair of Scissars, with very fine Blades, and sharp Points; small wooden Plates of the Lime-tree, or wooden Trenchers, a very fine Needle, Slips of Parchment as large as the Fishes; and Minnikin, or small Pins.

Take hold of the Fish with your Left-Hand, so as that the Belly may be towards the Hollow of your Hand, and it's Head pointed to your Breast. Then with the Needle make a Wound behind it's Head, into which introduce one of the Points of your Scissars, cutting gently from thence along to the Tail. If you would preserve the Right Side, the Scissars are to be conducted on the Left Side of the Fin. This being done from the Head to the Tail, the Scissars are to be pointed deeper

A Method of preparing Specimens of Fish, by drying their Skins, as practised by John Frid. Gronovius, M.D. at Leyden, No. 463. p. 57. Read March 4, 1741-2.

deeper, and the Flesh divided quite to the Back-bone. Then turn the Fish with it's Back downward, and it's Belly upward, and proceed in the same Manner, cutting with the Scissars through both Head and Jaws. Take away the Brain and Gills. The Fish then easily parts, the Intestines appear, which may be easily taken away. The Back-bones are then to be cut asunder, the Fish is to be washed, rubbed till it is dry with a Linen Cloth, and placed upon a Board, in such a Manner as that the Skin, covered with it's Scales, may lie uppermost, and all the Fins and Tail are to be expanded with Pins. Let it then be exposed to the Sun, if in Summer, or, if in Winter, to the Fire, till the Skin grows quite dry and hard, when it must be turned, and the Flesh exposed to the Sun or Fire, till it is also dry; and then the Skin may be separated from the Flesh with very little Trouble, and, being put betwixt Papers, must be pressed flat. But as a Sort of glutinous Matter, in pressing, is always forced out from betwixt the Scales and the Skin, a Piece of Parchment is to be laid under the Fish, which is easily separated from the Scales, but Paper always sticks: For this Reason it is necessary, that after an Hour or two, a fresh Piece of Parchment should be applied: And thus, in the Space of 24 Hours, the Fish is prepared.

A Dissertation concerning the Flying Squirrel, by Ja. Theodore Klein, Sec. to the Republick of Dantzick, and F. R. S. No. 427, p. 32. Jan. &c. 1733.

XX. 1. The flying Squirrel is mentioned by *Levinus Vincentius* *, under the Name of *Sciurus Virginiensis volans*, without any farther Description. I have also been informed, that a Gentleman at London had a *Virginia Squirrel*, which slept the whole Winter, without ever waking, unless it was brought near to the Fire.

There is one in *Grew's Catalogue of Rarities*, p. 20, under the Name of Flying Squirrel; which the Author takes to be the same Animal that *Scaliger* † meant under the Name of *Felis volans*.

Another is mentioned by *Lawson*, in his *History of Carolina*; and another by *Gesner* ‖, under the Name of *Mus Ponticus aut Scythicus sive Sciurus volans & latus*. He saw only the dried Skin, and gave a Figure of it.

March 19, 1727. Two of this last mentioned Sort were presented alive at *Warsaw*, to King *Augustus II.* They were observed by M. à *Heucher*, his Majesty's chief Physician, who also dissected one of them which hapened to die, and favoured me with a Draught of the Body expanded, and of the Skeleton.

The same Year the Princess *Radzivil* promised to send me one alive, which I received in the Summer of 1728, by Dr *Floercke*, her chief Physician; and it is now alive.

Fig. 47, 48.

It was found in the Woods of *Kriczow*, in the Borders of *Russia*. The Inhabitants relate that these Animals live in hollow Oaks, and, wrapping themselves up in the Moss of the Birch-trees, sleep all Day;

* *Cat. & Descript. Animalium*, 1726, p. 8. Cent. 1. No. 92.

† *Exerc.* 217. §. 9.

‖ *De Quadrup.* p. 743.

but get up at Night, and seek their Food. This Points out the following Method of taking them.

When the Huntsmen judge that a Squirrel is hidden in any hollow Tree, they spread their Nets over the Holes in the Trunk, and make a Fire at the Root. As soon as the Smoak gets into the Tree, the Squirrels forsake their Nest, fall into the Nets and are taken.

The natural Size of this Animal is expressed in *Fig. 46.* It is consequently smaller than the common Squirrel, and larger than the Dormouse, which frequent our Woods. Our People call the flying Squirrels, *Kings of their Family, Koenige der Grauwuercke.*

The Skin is very soft, and beautifully diversified with hoary and dark grey Hairs. It has large, black, prominent, beautiful Eyes, and very sharp Teeth, with which it bites severely; for most of them are very malicious. Mine is pretty gentle, and does not bite one's Finger, when one gives it any thing; but I would not advise any one to provoke it. When it does not leap, it presses it's Tail handsomely to it's Back; but when it springs, it waves it to and fro. It eats Bread made without Salt, is very fond of the fresh Tops of Birch, but does not care either for Nuts or Almonds. It makes a neat Bed of the Moss of the Birch-trees, and drawing it with wonderful Facility by it's Feet, lies as it were buried in it; and for a whole Day together does not come out of it, unless compelled by Thirst.

As for what relates to it's flying Instrument, the Skin may be expanded about a Palm from it's Sides like a Sail; and this Sail adheres to the Knees of it's hinder Legs, and is connected with the bony Articulation of the Fore-legs: and the Skin is in a manner feathered at the Extremity of that Articulation.

When it sits still, or only walks, this Articulation, being parallel with the Legs, cannot be distinguished; but as soon as the Animal makes a Leap, it is moved, and makes almost a right Angle with the Fore Leg, whence the Skin, as was said before, is expanded; tho' at the same time a strong fleshy Sinew, going thro' the whole Skin, greatly forwards the Leap.

Hence I infer, that this Animal does not properly fly, but reaches more distant Places with greater Ease than other Animals of the same Kind can leap to, and makes greater Leaps, because it can hang longer in the Air by means of it's Sails.

Compare with this Squirrel of ours the *Vespertilio admirabilis Bontii* *. *Piso* was doubtful whether it ought to be ascribed to the Family of Bats. 'As it is of the Size of a Cat, with a thick, fleshy Belly and Breast, and is covered from the Neck to the Extremity of the Claws almost, with a continued Membrane like a Sail; and as this Sail is membranaceous underneath, and covered, as in the rest, with Down, Veins, and Fibres, but on the Outside is cloathed with a soft Furr

* *Hist. Nat. & Med. Ind. Orient. Cap. 16. apud Pisonem, p. 68.*

‘ like a Rabbet, composed of very soft, hoary and dark grey Hairs;
 ‘ also as it is destitute of those Folds by which the Wings of others
 ‘ are contracted and extended, and is about 3 Feet long, and as much
 ‘ broad.’

As for what *Bontius* asserts, that these wonderful Bats fly like Wild-geese in Flocks, I cannot bring myself to believe it, when I consider the Bulk and Structure of this Animal, but rather that they come near to our flying Squirrels, and use their Sails like ours for the same Purpose. Nor am I the more convinced by what *Bontius* affirms, *That about Evening they are seen hanging in the Air or upon Trees.* Nay I think it rather shews, that these Bats, as well as our flying Squirrels, sleep in the Day-time, and about Evening frequent the Trees, and as they leap about, look like Tumblers hanging in the Air, and when their Leap is finished, hang upon the Trees.

As for these wonderful Bats deserving the Name of *Flying Cats*, as well as our Flying Squirrels, which *Gesner* has called by that Name, I am not at all sollicitous about it.

I shall only add, that I have had confirmed what *Gesner* relates from *Vincentius Beluacensis*, and *Olaus Magnus*, that the common Squirrels, when they have a Mind to cross the Water, lay a very light Piece of Wood upon the Water, and getting upon it, sail over with their Tail not erected, as he says, but in continual Motion, and not when the Wind blows, but when it is calm. This has been observed more than once by my faithful Emiffary to the Islands of *Gothland*,

— by Mr Samuel Dale,
 N^o 444, p.
 389, Nov.
 &c. 1736.

2. I find that Mr *Ray* in his *Synop. Quad.* p. 215, rather refers the *Sciurus Americanus volans*, to the Mouse than to the Squirrel-kind; because their Tails are broad and plain, and not turned over their Backs when they sit; which Mistake may perhaps arise from only seeing the Skin of one dead, when the Hair of the Tail had been eaten off by Mites; for in one that I did see alive, which was brought over from *Virginia*, the Tail was hairy, as in others of the Squirrel-kind, tho’ rather more thin, and did turn over the Back as other Squirrels do.

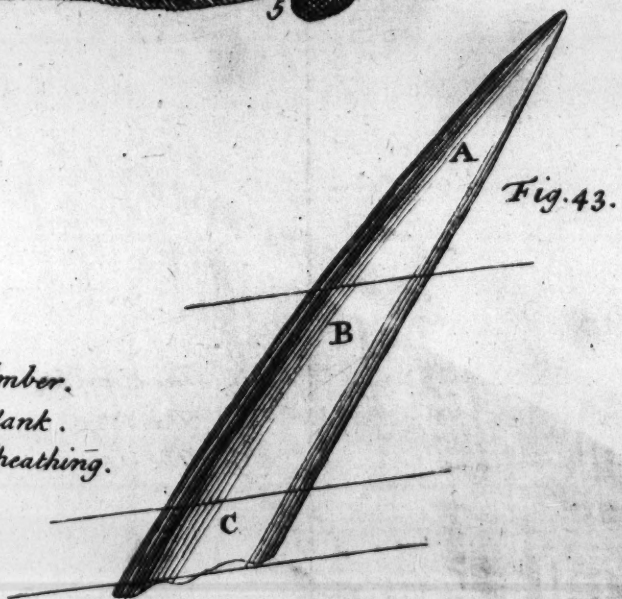
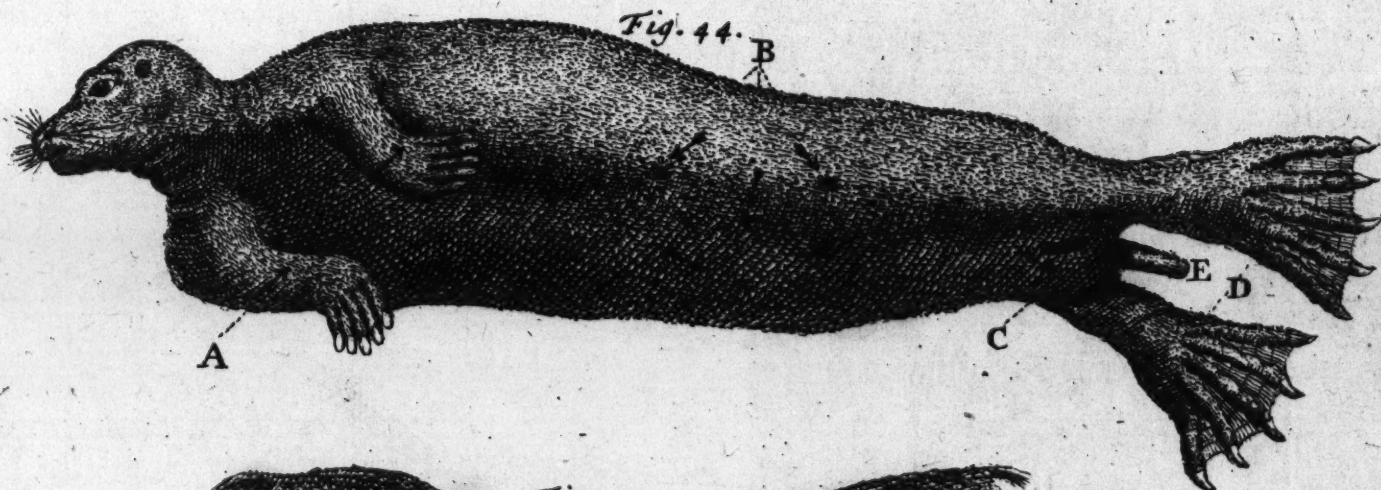
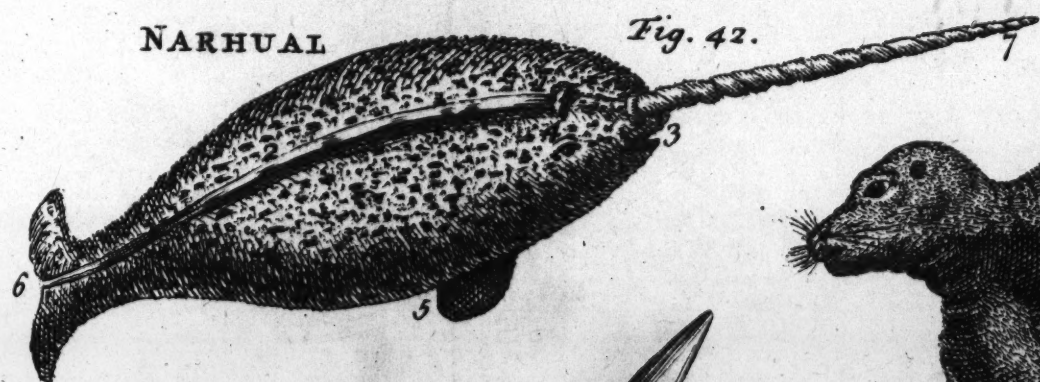
Anatomy of a
 Female Beaver,
 and an
 Account of
 Castor found
 in her. By
 C. Mortimer,
 M. D. R. S.
 Sec. N^o 430.
 p. 172. Nov.
 &c. 1733.

XXI. In the *Acta Erudit. Mense Aug.* 1684, p. 360, & seq. I find the Account of the Dissection of a Male and Female Beaver by *E. G. H.* who mistakes, in opening the Male, the Receptacles of the Castor for the Uterus, and the two Glands below them for Dugs; and as they found a Penis and Testicles in the same Animal, they were ready to conclude it to be an Hermaphrodite: But on dissecting the Female, they found a Uterus, with two Horns like that of Bitches, beside the Receptacles of the Castor, which I should have thought sufficient to have set our Anatomist to rights, as to the former Beaver’s being an Hermaphrodite.

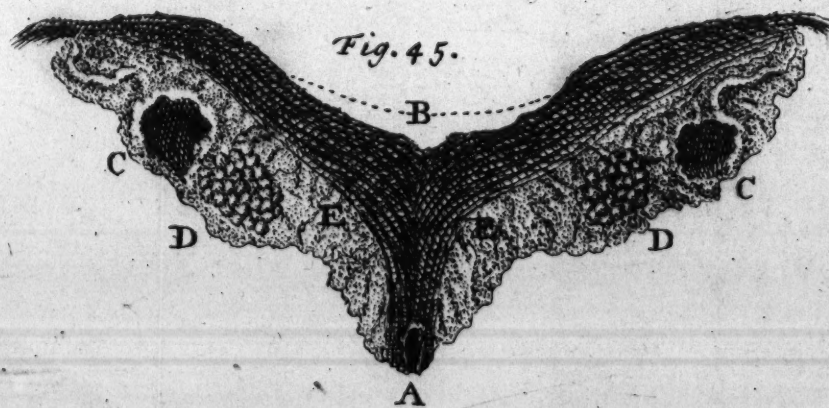
Jobannes Francus, a German Physician, hath published a Treatise called, *Castoreologia explicans Castoris animalis naturam & usum Medicochemicum*, *August. Vindel.* 1685, 8vo. being a Commentary on a Treatise formerly written by one *Johan. Marius*, a Physician at *Ulm*.



NARHUAL



- A The Timber.
- B The Plank.
- C The Sheathing.



Marius *, describes the Receptacles of the *Castor*, as being Bags near as big as a Goose-Egg; and that they have been wrongly called the *Testicles*, being in Females as well as Males, but that they have no Communication with the *Pudenda*. His Commentator *Francus* recites the Opinions of some modern Writers, who are still in the old Error as ancient as *Ælian*, who says, that the *Beaver* bites out his own *Testicles*, when pursued by the Hunters, as if he were conscious those were the Parts his Persecutors want, and seek his Life for. He cites *Adam Zwikerus* as having this Notion, and likewise *Job. Harderus* and *Job. Schapplerus*; nay, some have thought so absurdly, as to imagine that the *Beaver* had four *Testicles*: And he says, that *Gulielmus Rondeletius* was the first Person who dissected a *Beaver* with Accuracy sufficient to refute the old Error; shewing that the *Castor* was not the *Testicles*, but peculiar Bags lying in the Groin.

Marius †, says, that *Beavers* are found in the *Ilera*, and the *Danube*, particularly in a small River near *Leipheim*, called the *Biber*. The Commentator saith this River hath it's Name from the vast Numbers which were formerly found thereabouts, *Biber* being German for a *Beaver*, but that now they are all destroyed, and none to be found in the *Danube*, except in *Austria*; that there are a few in some Rivers in *Switzerland*, in *Poland*, in *Muscovy*, in the *Wolga*, in the *West-Indies*, especially in *Canada*. The greatest Quantity of *Castor*, which is brought to *England*, comes from *Maryland*, *New-England*, and *Hudson's-Bay*.

He ‖ tells a Story of a peculiar Virtue in the Fur of the *Beaver*, which he had from a *Jew*, who informed him, that by wearing on one's Head a Cap made of the Fur of the *Beaver*, and by anointing the Head once a Month with Oil of *Castor*, and taking two or three Ounces of *Castor* in a Year, one's Memory will be so strengthened, as to be able to remember every thing one reads. Though this seems to be only a superstitious Fancy, yet I mention it, because probably such a Notion might have at first brought the Use of the Flock of this Animal into Request for making Hats.

In the Memoirs of the *Academy of Sciences* at *Paris* †, is an Extract of a Letter from *M. Sarrafin*, the King's Physician in *Canada*, concerning the Anatomy of the *Beaver*, dated *Octob. 25. 1700*, at *Quebec*. He says, the largest are 3 or 4 Feet long, and about a Foot or 15 Inches broad in the Chest, and in the Hanches; that they commonly weigh about 50 Pounds; and they usually live to the Age of 20 Years; but *Francus* says, they live 30 or 40 Years, and *ad Sect. VIII.* that he heard of a tame one being kept 78 Years: Perhaps the *European* may generally be longer liv'd than the *American*. Dr *Sarrafin* says farther, that a great Way North these Animals are

* *Sect. VII.*

† *Sect. IX.*

‖ *Sect. XI.*

† *An. 1704. p. 48, & seq.*

very black, though there are some white ones to be seen; those in *Canada* are commonly brown, but their Colour grows lighter, as they are found in more temperate Countries; for they are yellow, and even almost of a Straw colour in the Country of the *Illinois* and *Chaouanons*. Our Author then gives a very particular Account of the several Parts External and Internal of this Animal: He takes especial Notice of the Stomach, which, he says, is above a Foot long, and about 4 Inches broad in the Part next to the Spleen; that at about $\frac{2}{3}$ of it's Length, it is contracted to half it's former Capacity for an Inch in Length; that then it widens again to 3 Inches towards the *Pylorus*, which is raised very high, is round, and drawn towards the *Spleen* by a Membrane which adheres to the *Œsophagus* by it's other End. Tho' this Dilatation seems to make a second Stomach, it only serves to retain the Aliments a longer time, especially the more solid, as the Wood which only undergoes a slight Extraction, passing thro' with very little Alteration, whereas Herbs, Fruits, and Roots are perfectly dissolved. The Membranes of the Stomach are very thin, so that this second Part will scarce bear being distended with Wind.

In a *Beaver* full grown the *Cæcum*, which is in Form of a Sickle, is 18 Inches long on the hollow Side, and 30 Inches on the round Side, and 4 Inches broad at the larger End, and will contain between 5 and 6 Pints of Water.

When he describes the Receptacles of the *Castor*, he says that the uppermost Bags contain a soft resinous Matter, but that the lower ones are filled with an oily Matter; the greatest Bags weigh but two Ounces.

Dr *Sarrafin* says, that he was never able to discover what use this *Castor* was of to the *Beavers* themselves, being well assured that they do not themselves swallow it to excite their own Appetite. It is likewise false, that the Hunters use it as a Bait to draw the *Beavers* into their Toils, though they do use it to entice those Animals which infest the *Beavers*, as Martins, Foxes, Bears, &c.

Our Author having finished the Anatomical Description of this Animal, subjoins several things regarding their manner of living, as that they choose a low level Ground watered with a small Rivulet, that it may be easily overflowed, which they do by making Damms a-crofs it: They make these Damms by thrusting down Stakes of 5 or 6 Feet long, and as thick as one's Arm, pretty deep into the Ground; these they will wattle a-crofs with tender pliable Boughs, and fill up the Spaces with Clay, making a Slope on the Side against which the Water presses, but leaving the other perpendicular. They make their Houses after the same manner; the Walls are upright, 2 Foot thick, and at Top in Form of a Dome; they are usually oval, 5 or 6 Feet long on the Inside and near as broad; being sufficient to lodge 8 or 10 *Beavers*, and 2 or 3 Stories high, which they inhabit as the Water rises or falls.

Sometimes

Sometimes they build several Houses near together, which communicate with one another. He says there are some *Beavers* called *Terriers*, which burrow in the Earth: They begin their Hole at such a Depth under Water as they know that the Water will not freeze so deep; this they carry on for 5 or 6 Feet, and but just large enough for them to creep through; then they make a Bathing-Place 3 or 4 Feet every Way; from whence they continue the Burrow, always ascending by Stories, that they may lodge dry as the Waters rise; Some of these Burrows have been found to be 100 Feet long. They cover the Places where they lie with Weeds; and in Winter they make Chips of Wood, which serve them for Matelas's: They live on Herbs, Fruits, and Roots in Summer, but against Winter they lay up a Provision of Wood, a Stack of 25 or 30 Feet Square, and 8 or 10 high, is the usual Quantity for 8 or 10 *Beavers*: They only eat those Pieces which are soaked in the Water. The above-cited *Marius* says, they only live on such Vegetable Food; but his Commentator *Francus* * says that they prey upon Fish, Cray-fish, and Frogs likewise, as do *Otters*: And that they make Burrows in the Banks of the Rivers, opening under the Water.

In the *Memoires pour servir à l'Histoire Naturelle des Animaux*, composed by Order of *Lewis XIV*, printed at *Paris* 1671, in *Folio* †, I find an Anatomical Description of a *Beaver*, with a Plate, in which are represented some of the most remarkable Parts, as the Brain, the Fore-foot, the *Intestinum Cæcum*, and the Parts of Generation of a Male *Beaver*, with the Receptacles of the *Castor* delineated in their natural Situation ‖. Our Author says, that the real Testicles resemble those of Dogs; that they lie close to the *Os Pubis*, on the outward Part of the Sides, and that they are not at all discernible thro' the Skin. The *Penis* had a sharp-pointed Bone, in it's Extremity, like that of a Dog; but instead of lying with it's Point towards the Navel of the Creature, it lay with it towards the Tail, and was so deep buried in the *Fissure*, which serves in common for the *Anus*, for the *Penis*, and the *Excretory Ducts* of the *Castor*, that they could not distinguish what Sex the *Beaver* was of, 'till the Skin was taken off.

Our Author says, that in opening the *Intestines* they found in them 8 large Worms resembling common Earth-Worms, 3 of which were 7 or 8 Inches long, the rest only 4.

In the Heart were the plain Footsteps of the *Foramen Ovale*.

A little below the *Coronary-Vein*, he mentions a *Valve*, which he says is called *Valvula nobilis*, and closes the whole *Vena Cava*, but opens so that the Blood can flow readily from the *Liver* towards the *Heart*, and not from the *Heart* back again towards the *Liver*.

This Author says, that the *Brain* was but $1 \frac{2}{3}$ Inch long, and $1 \frac{1}{2}$ broad, which was very small in Proportion to the Size of the Creature

* *Ad Sect. IV.*

† *Pag. 64, & seq.*

‖ *Pag. 69.*

and still more so in Proportion to the Sagacity with which it is said he is endowed.

These are the most remarkable Particulars I met with in reading over the above-mentioned Books. I shall now add only such as they have passed over, or what especially regard the Sex of this Female *Beaver*.

This Creature was kept in Sir *Hans Sloane's* Garden, for about 3 Months. She was but about half grown, not being above 22 Inches long from the Nose to the Root of the Tail; the Tail 8 Inches long. She was very thick, paunch-bellied; the Shape of the Head, and indeed of the whole Animal, except the Tail, and Hind-feet, very much resembled a great over-grown Water-Rat.

Her Food was Bread and Water; some Willow-Boughs were given her, of which she eat but little; but when she was loose in the Garden, she seemed to like the Vines much, having gnawn several of them as high as she could reach quite down to the Roots: She gnawed the *Jeffamy* likewise, but least of all some Holly Trees. I am told that in *Carolina* they particularly love the *Sassafras*, and will cut down Trees of between 2 and 3 Feet Diameter. She was turned into a Fountain with some live Flounders, but never offered to strike at them, as an *Otter* would have done. When she eat, she always sat on her hind Legs, and held the Bread in her Paws like a Squirrel. When she slept she commonly lay upon her Belly, with her Tail under her. In swimming she held her Fore-feet close up under her Throat, and the Claws closed, as when one brings the Ends of one's Thumb and of all the Fingers close together, never moving her Fore-feet 'till she came to the Side, and endeavoured to get out. She swam with her Hind-feet only, which had 5 Toes, and were webbed like those of a Goose; the Tail, which was scaly, and in Form of the Blade of an Oar, served as a Rudder, with which she steered herself, especially when she swam under Water, which she would do for 2 or 3 Minutes, and then come up to vent, sometimes raising her Nostrils only above Water: She swam much swifter than any Water-Fowl, moving under Water as swift, I believe, as a Carp. The Hind-Legs being much longer than the Fore, made her walk but slowly, or rather waddle like a Duck when on dry Land; and if drove along fast, she could not run, but went by Jumps, flapping her Tail against the Ground. Her Excrements were always black and extraordinary fetid; her Urine turbid and whitish, and very strong scented. I never heard her make any Noise, except a little sort of a grunting, when driven fast and angred. She seemed very brisk, and thrived well with the above-mentioned Food, being turned into the Fountain to bath 3 or 4 times a Week; but the Author of the *Memoires &c.* above-cited, says, that the Male *Beaver* they dissected, had lived several Years at *Versailles* without being permitted to go into the Water. Our *Beaver* had one Day Convulsion Fits, very like the Epilepsy in Men, from which she recovered soon, and was very well after them,
till

'till at last she was killed by a Dog; when she was so torn, that we could see nothing Particular in the *Heart*, or in the *Lungs*. In the *Abdomen* the *Liver* and *Kidnies* were quite torn a-pieces. There were several Holes bit through the Stomach, out of one of which crawled a Worm about 6 or 7 Inches long, like a common Earth-Worm, being probably of the same Sort as those mentioned before by the Author of the *Memoires*, &c. The Bowels in general seemed very much to resemble those of Dogs, except the *Intestinum Cæcum*, which was of that prodigious Size as is above-mentioned. This Creature being a Female, we found the *Ovaria* and the *Uterus* divided into two Horns, in the same Situation as in Bitches: The Bladder was contracted about the Size of a Walnut, very much wrinkled on the outside; it lay exactly over the Body of the *Uterus*; the *Meatus Urinarius* ran upon the *Vagina* above 2 Inches in Length. Just below the *Os Pubis*, on each Side of the *Vagina*, and above the *Meatus Urinarius* (supposing the Animal to lie on her Back, as when we opened her) we found a Pair of Bags in Form of Pears, about an Inch and three quarters long, and one Inch broad, diverging at their Bottoms, or broad Ends, but joined almost close together at their Necks, or narrow Ends, which were Canals communicating with the adjoining *Glands*. The *Membranes* which formed these Bags were very tough, full of Wrinkles and Furrows, and of a livid dirty Colour; they were hollow, and able to contain about an Ounce of Water. Upon opening one of them, we found a small Quantity of a dark brown Liquor like Tar, of the Consistence of a thick Syrup, which smelt exactly like *Castor*, and had a Sort of Pungency like Spirit of Hart's-horn, which the dried *Castor* doth not retain. It is very probable that the Youth of our Animal was the Reason why these Bags were not full; and that the *Castor* itself was not of that soft resinous Consistence as mentioned by Dr *Sarrazin* *. These must be the Bags mistaken in the *Act. Eruditor.* for the *Uterus*. About one Inch lower were situated a Pair of *Glandular Bodies*, one on each Side the *Vagina*, about $1\frac{1}{2}$ Inch in Length, and $\frac{1}{2}$ an Inch in Breadth: They were of an oblong irregular Shape, of a pale Flesh-colour, like the *Pancreas*, or other *Glands*, and having several Protuberances outwardly. These *Glands* seem to communicate with the above-described Bags, the Canals coming down from them being implanted into the *Glands*, and both the *Bag* and *Gland* on each Side hath but one Orifice, which is black, beset with long black Hairs, and opens into the lower Part of the *Rima*, or great *Fissure*, into which likewise open the *Vagina* and the *Anus*. From the Structure of these *Glands*, and their Connection with the Bags, I conclude, that the *Castor* is secreted in these *Glands*, where it is fluid like Oil, light coloured, and hardly having any Smell; that it runs down into the Bags, which serve as Receptacles to collect a large Quantity together for the Use of the

* *Loc. citat.*

Beaver, and that in these Receptacles it loses it's thinner Parts, becomes more inspissate, of an higher Colour, and of a stronger Scent, much in the same manner as the *Gall* in the *Gall-Bladder*, which there becomes so different from what it was in the *Liver*.

It is certain that Ducks, Geese, and all sorts of Water-Fowl, have a *Gland* in their Rump, from which they express with their Bill an oily Matter, and with it anoint or dress their Feathers, to prevent their being soaked by the water in which they swim; and the *Glands* of that large Sort of Duck commonly called the *Muscovy-Duck*, or more properly the *Musk-Duck*, afford such an Oil, as sweet-scented as *Civet*: I therefore think it probable, as the *Beaver* is an Animal, which frequents the Water as much as those Water-Fowls, that the *Castor* is a Substance provided by Nature for him to grease and anoint his Fur with, to prevent the Water from soaking quite to his Skin; and as the *Castor* is impregnated with penetrating pungent Particles, it may likewise contribute to keep off the Cold and Chill which the Water might otherwise strike to his Body, by remaining a long time in it.

As none of the Authors I have met with have given any Delineation of the Parts of Generation, or of the Receptacles of the *Castor* in a Female *Beaver*, I have drawn them after Nature, as they are represented in the Figure.

Fig. 49.

A. The two *Ureters*. B B. The *Ovaria*. C. The *Uterus* lying under the *Bladder*. D. The *Bladder*, contracted and empty of *Urine*. E. The *Meatus Urinarius*, above 2 Inches long. F F. The *Receptacles*, containing the *Castor*. G G. The two *Glandules*, which open by one common Orifice, with the *Receptacles*, at H H. the Orifices of the *Castor-Ducts*. I The *Vagina* cut off. K. The *Anus*. L. Part of the *Tail*.

Descriptions of
the Moose-
Deer of New-
England, and
a sort of Stag
in Virginia; by
Mr Samuel
Dale. No.
444. P. 384.
Nov. & Dec.
1736.

XXII. 1. This Animal hath been mentioned by several Authors, but their Accounts have generally been so very imperfect, that little Satisfaction hath thereby been given to the curious Enquirers after Natural History. The first Mention that I find of this *Moose-Deer* is by Mr *Josselyn*, in a little Tract called *New-England Rarities*, where* that Author writes, *That 'tis a goodly Creature, some of which being 12 Foot high, their Horns exceeding fair, with broad Palms, some being 2 Fathoms from the Tip of one Horn to the other*. Much to the same purpose is the Account he gives of this Animal in another Book of his, called *Two Voyages to New-England*†, in which he saith, that *The Moose, or Elke, is a Creature or rather a Monster of Superfluity, when full grown, being many times bigger than an English Ox*. What *Neal* in his *History of New-England*‡, hath of this Animal, called by him the *Mose*, is copied from the aforesaid *Josselyn*. The best and fullest Account of this Animal was sent by the Hon. *Paul Dudley*, Esq; P. R. S: This is published in the *Philos. Trans.* ** where he makes them to be of

* Pag. 19. † Pag. 88. Part iii. chap. 1. §. 18.

‡ Vol. II. p. 573.

** See Vol. VII.

two Sorts, viz. The common light grey Moose, called by the Indians, *Wampoofe*; and the large or black-Moose, which is the Beast whose Horns I herewith present*. As to the grey Moose, I take it to be no other than what Mr John Clayton, in his Account of the *Virginian Quadrupedes*†, calls the *Elke*; which Beast by the *Parisians*, in their *Memoirs for a Natural History of Animals*, englished by Mr Pitfield‡, is called by the Name of the *Stag of Canada*, of which I have seen a single Horn, sent by Mr Mark Catesby from *Virginia*, by the Name of an *Elk's-horn*, and was in all respects like those of our red Deer or Stags, only larger, weighing about 12 Pounds *Haverdupoize*, and from the Burr to the Tip, measured by a String, about 6 Foot high. Mr Dudley writes, that his grey Moose is most like to the ordinary Deer; that they spring like them, and herd together sometimes to 30 in a Company: But whether he means by that Term the *Red*, the *Virginian*, or the *Fallow-Deer*, is uncertain, he having said nothing of their Horns, which was needful to distinguish them. The black Moose is (by all that have hitherto writ of it) accounted a very large Creature. Mr Josselyn (as I before mentioned) makes it many times bigger than an Ox; and Mr Dudley writes, that the Hunters have found a Buck or Stag-Moose 14 Spans in Height from the Withers, which at 9 Inches to the Span, is 10 $\frac{1}{2}$ Feet; and that a Doe or Hind of the fourth Year, killed by a Gentleman near *Boston*, wanted but one Inch of 7 Feet in Height. The Stag, Buck, or Male of this kind, hath a palmed Horn, not like that of our common or Fallow-Deer, but the Palm is much longer, and more like to that of the *German Elke*, from which it differs, in that the Moose hath a branched Brow-Antler between the Burr and the Palm, which the *German Elke* hath not.

Nor doth the Horn of this *New-England black Moose* agree in Figure with either of those mentioned in the *Philos. Trans.*** to be found Fossil in *Ireland*, the last of which, Mr Kelly writes, that for want of another Name they called them *Elks-Horns*. I suspect that those Horns which the late Reverend and Learned Mr Ray mentions in his *Synopsis Method. Animal. Quadrup.* to have seen with one Mr Holney, an Apothecary of *Lewis* in *Sussex*, as likewise in divers *Museums*, were not the

* The Dimensions of these Horns, are as follow.

Fig. 50, 51.

		Inches.
Fig. 50.	A B	56
	C A	34
	C E	31
	C D	34
	D H	30
	E G	9 $\frac{1}{2}$
	F I	14
	K L	7

		Inches.
Fig. 51.	a b	11
	a cb	20
	a d	12 $\frac{1}{2}$
	d f	12 $\frac{1}{2}$
	d e	11
	g h	2 $\frac{3}{4}$

† See Vol. VIII. Part ii. chap. 3. §. 19.
chap. 3. §. 36. & Vol. VI. Part ii. chap. 3. §. 16.

‡ Pag. 167.

** See Vol. II.

Horns of this *black* or *American Moose*, but of the *German Elke*, because that inquisitive Gentleman takes no Notice of any *Brow-Antlers* that they had ; which, I think, was too notorious to have escaped his Observation, had there been any such.

Concerning the Number of young ones, or *Calves*, which the *Moose* brings forth at a time, Authors vary ; for Mr *Dudley* saith, that they bring forth but two ; but *Josselyn* in his *Two Voyages* †, and from him *Neal*, that they are three, and that they do not go so long pregnant as our *Hinds* by 2 Months. What these two last mentioned Authors write concerning their casting their *Calves* a Mile distant from each other, doth not seem to me probable. Nor do I find that *Neal*, in his Description of this Beast, makes any Mention of their having a long Tail, tho' so charged to do by Mr *Dudley*, who likewise omits the *Brow-Antlers* in his Description of their *Horns*.

There is another Beast of the *Deer-kind*, which, tho' very common in *Virginia*, and without doubt in other of the northern Provinces of *America*, yet I think it is not described by any Author ; Mr *Beverly*, in his *Present State of Virginia*, mentions both *Elke* and *Deer* in that Country, but doth not describe either : But by what I have received from Mr *Catesby*, the first should be the *Canada-Stag*, and the other the *Deer* I have here mentioned. Mr *Clayton* likewise mentions the *Elke*, which he saith are beyond the inhabited Parts, and are the same with Mr *Beverly's* ; as also the *Deer*, of which he saith there are Abundance, yet doth not describe them, but calls them *Red-Deer*, tho' they are not the same as we here call by that Name, but of those which follow. Mr *Neal* likewise mentions *Deer* in *New-England*, but gives only the Name, which being general, nothing can be inferred from it.

That which I take for the undescribed *Deer*, is a Beast of the *Stag-kind*, having round *Horns* like them, not spreading out as in the *Stag* or *Red-Deer*, but meeting nearer together at their Tips, and bending forward over the Face of the Animal ; the *Brow-Antlers* likewise are not crooked and standing forward, but strait and upright. The Skin of this *Deer* is of a sandy Colour, with some black Hairs intermixed, and spotted all over, while young, with white Spots, like some Sorts of our *Fallow-Deer*, being also about the Bigness of them when fully grown. The *Dama Virginiana Raii* ||, which was formerly in *St James's Park*, seems to be different from this, if Mr *Willoughby* was not led into a Mistake in taking it be of the *Palmate-kind*, by only seeing it when the *Horns* were shed. Perhaps this last of Mr *Ray* may be the *Maurouse* of *Josselyn's Voyages* *, which, he saith, is like the *Moose*, but his *Horns* are but small, and the Beast about the Size of a *Stag* ; but his Description is too short to be satisfactory.

There are other Sorts of *Deer* mentioned by Mr *Josselyn* in his last quoted Book †, as Inhabitants of that Country, as the *Buck*, *Stag*, and

Fig 51.

† Pag. 89.

|| Synop. Animal. Quad. p. 86.

* Pag. 91.

† Pag. 87.
Rein-

Rein-Deer; but whether they are the same with those called by the same Names in *Europe*, I cannot determine, the Descriptions of them being omitted. He mentions likewise, for another Sort of *American-Deer*, an Animal called a *Maccarib*, *Caribo* or *Pobano*; but by the Account he gives, it seems to be a Fiction, no such Animal being, I believe, in *Rerum Natura*.

2. As to the large Horns found *Fossil* in *Ireland*, I have taken particular Notice, (in several I have seen) beside the main Horns being palmated, that the Brow-Antlers are likewise palmated; which is a Circumstance peculiar to the *Rein-Deer* Species, being of great Service to them in removing the Snow, in order to get at the Grass or Moss underneath, which is their chief Subsistence in *Lapland*.

XXIII. In the Year 1728, I was busied in endeavouring to prove, that the extraordinary large Teeth and Bones found under Ground, and digged up in several Places of *Siberia*, by the Name of *Mammoth's*, or *Mammul's*, Teeth and Bones, were, 1. True Bones and Teeth of some large Animals once living; and, 2. That those Animals were *Elephants*, by the Analogy of the Teeth and Bones with the known ones of *Elephants*. 3. That they were brought and left there by the universal Deluge. I made likewise several useful Inferences about this Matter.

At the same time there flourished in our City a Society of some learned and ingenious Gentlemen, who met once a Week in a certain Place: In one of those Meetings in the Month of *March*, I had the Honour to read and communicate my Thoughts and Observations about this Subject; which I have here translated into the *English* Tongue.

After that, in the Year 1730, Dr *Messerschmidt* returned to *Dantzick*, from his Travels through *Siberia*, and was pleased to communicate to me some curious Draughts of a Part of a Skeleton, to wit, of a very large Skull, *Dens exsertus & molaris*, with the *Os femoris*, belonging to the Animal commonly called *Mammoth* found in *Siberia*; by which our Assertion, that the Teeth and Bones, called in *Rusland* *Mammoth's* Bones, are the true Teeth and Bones of *Elephants*, is, if I am not mistaken, demonstrated beyond all Doubt. Dantz. 28 Sept. 1735.

Dr *Daniel Gottlieb Messerschmidt*, who was sent some Years ago, by his late *Czarish* Majesty, *Peter the Great*, into *Siberia*, to search after the Products of Nature in this uninhabited and cold Country, was pleased to send me in the Year 1722, amongst some other Samples of Natural Things out of *Siberia*, two very large Teeth, called there, *Mammoth* or *Mammul's* Teeth, with the following Inscription: *Dens molaris, ut videtur, diluvianus, Belluæ cujusdam hætenus incognitæ, nisi pro Elephantino habendus sit, cujus jam penes te esto arbitrium, Russis Mammoth, repertus in montium altissimis jugis ad Thomam fluvium. Alterum est frustum aliud Eboris Denti exerto Elephantis non absimile, ab aliis repertum in Thomæ Montibus.*

After I had made an accurate and nice Examination of them, I thought it worth my Pains, to shew you the same here.

A Remark by C. Mortimer, R. S. see *ibid.* p. 389.

Observations, and a Description of some Mammoth's Bones dug up in *Siberia*, proving them to have belonged to *Elephants*, by John Phil. Breyne, M. D. F. R. S. N^o 446. p. 124. July, &c. 1737.

Observations on the Mammoth's Bones and Teeth found in *Siberia*: Read in a Meeting of some learned Gentlemen at *Dantzick*, in the Year 1728, by J. P. B.

One is a *Dens Molaris*, or Grinder, a Foot broad, $\frac{1}{2}$ Foot long, and 3 Inches thick, weighing 8 lb and 3ij. pretty entire, except that it is broken in two Pieces, and the Extremities of the Roots spoiled. The Substance is between that of a Bone and Stone, except that on the upper Part of the Outside some parallel undulated Lines appear, which have still preserved the Enamel of the Tooth.

The other is a Piece of a *Dens exertus*, 8 Inches long and 3 Inches thick, of 1 Pound and 6 Ounces Weight; in some Places not different from Ivory, but in others calcined like the common *Unicornu Fossile*.

What *Ysbrand Ides* † mentioneth of the *Mammoth's* Teeth and Bones, deserves to be looked at; as also the Journal of *Laurens Lange's* Journey to *China* †, and the Remarks of Capt. *John Bernard Muller* *.

Those abovementioned, as far as I know, are the chief Authors which have treated of the *Mammoth's* Teeth and Bones, as a very remarkable and particular Curiosity of *Siberia*.

It would not be worth while, nor our Pains, to detain you with the Refutation of some partly merely fabulous Opinions, quoted by the said Authors, about the Origin of those Teeth and Bones: Therefore I design only to pick out of the Testimonies of Matters of Fact of the foresaid Authors, the following points to my Purpose:

1. That those Teeth and Bones are found in *Siberia*, chiefly in the Northern Parts, near the Rivers *Jenizea*, *Trugau*, *Mongam-Sea*, *Lena*, &c. towards the icy Sea; at the Time when the Ice has broken the Banks of those Rivers, so that Part of the adjacent Mountains do fall down; and that they are found in such Quantity as is sufficient for Trade, and to make a Monopoly for the *Czar* **.

2. That some Skeletons of this Kind are found very near complete.

3. That those Teeth and Bones are not found always of the same Size, but sometimes very large; as *Dentes molares*, or Grinders, of 20 or 24 Pound Weight †, and *Dentes exerti*, two of which weighed 400 Pound ||; sometimes of a middle Size, as mine above-mentioned, and at other times still smaller.

4. That of those Teeth, viz. *Dentes exerti*, some are used as Ivory, to make Combs, Boxes, and such other Things. Capt. *Muller* saith |||, that it in every thing resembles the common Ivory, being but a little more brittle, and easily turning yellow by Weather or Heat.

Out of these quoted Remarks joined to ocular Inspection, I think I may advance three Things.

I. That those *Mammoth's* Teeth and Bones are truly natural Teeth and Bones, belonging heretofore to very large living Animals; because they have not only the external Figures and Proportions, but also the

† In his Travels from *Mosco* to *China*. †* To be found in the *Present State of Russia*. ** Vid. *The Present State of Russia*. † Capt. *Muller* loc. cit. || *Ysbrand Ides*, loc. cit. ||| Vid. *Ysbrand Ides*, and Capt. *Muller*, loc. cit.

internal Structure analogous to natural Teeth and Bones of Animals.

II. That those large Animals have been *Elephants*; which appears by the Figure, Structure, and Bigness of the Teeth, which do accurately agree with the Grinders and Tusks of *Elephants*.

To be convinced hereof, one needs but to compare these Teeth with the Figures of those which some Years ago were dugged up in *Ireland*, and those which represent the very natural Teeth of *Elephants*, and consider the accurate Remarks made by Dr *Molineux* and other curious Fellows of the *Royal Society* thereon.

Nor needs any body to doubt, that they are true Teeth of *Elephants*; from the uncommon Size of the *Mammoth's* Teeth before-mentioned; because *Vertomannus*, as the famous Mr *John Ray* tells us, has seen in *Sumatra* a Pair of *Elephant's* Tusks of 336 Pound Weight; and *Terzagus*, in *Museo-Septaliano*, makes Mention of one 2 Yards long, and 160 Pound Weight.

III. That those Teeth and Bones of *Elephants* were brought thither by no other Means but those of a Deluge, by Waves and Winds, and left behind after the Waters returned into their Reservoirs, and were buried in the Earth, even near to the Tops of high Mountains. And because we know nothing of any particular extraordinary Deluge in those Countries, but of the universal Deluge of *Noah*, which we find described by *Moses*; I think it more than probable, that we ought to refer this strange *Phænomenon* to the said Deluge. In such Manner, not only the holy Scripture may serve to prove Natural History; but the Truth of the Scripture, which says that *Noah's* Flood was universal, a thing which is doubted by many, may be proved again by Natural History.

Here I must take Notice, that such Teeth and Bones also are to be found in several other Countries besides *Siberia*, as *Poland*, *Germany*, *Italy*, *England*, *Ireland*, and many others; but less common than in *Siberia*, and not so well preserved, but more wasted and calcined, without doubt by the greater Warmth of those Climates.

Hither are also be referred the large Bones found under Ground, or rather Tusks of *Elephants*, known by the Names of *Ebur, seu Unicornu fossile*, which are of the same Origin with the *Mammoth's* Teeth, but different, as they are better preserved, and therefore, for a great Part, have still the natural bony Substance, and may serve the Workmen as natural Ivory, and in some measure the Physicians and Apothecaries as *Ebur, seu Unicornu fossile*.

Fig. 52. A Front View of the Head. It weighs 130 lb 3ij. 3v. 3j. Apothecaries Weight, or 152 Russian Pounds. It's Length or greatest Height is 48 Inches. It's greatest Breadth near the Ears, 29 Inches, 5 Lines. It's Thickness from the Forehead to the Nape of Neck, 22 Inches, 5 Lines. *a a*. The *Os frontis*. *b b*. The *Sutura sagittalis*, hardly to be discerned. *c*. The bony *Septum Nasi*, or the

An Explanation of the Draughts of the above-mentioned Antediluvian Bones of an Animal commonly called, The Mam.

moth of Siberia ; or of the Bones of the fossil Skeleton of an Elephant ; done to the ancient Roman Scale contracted, and exhibited in six Figures. Translated from the Latin by T. S. M.D. F. R. S. Fig. 52.

external Process of the *Os ethmoides*, without it's Fellow. *dd*. The Coronal Suture appearing imperfect. *ee*. The *Ossa Sincipitis*. *ff*. The *Sutura squamosa* of the Temples. *gg*. The *Sutura lambdoidea* of the Occiput. *h*. The external *Processus zygomaticus* of the *Os temporum*. *i*. The posterior lateral, or zygomatic Process of the *Os male* (or Cheek-bone). *k*. The upper Process of the *Os male*, joined with the outer Process of the *Os frontis*, and constituting a Part of the Orbit of the Eye. *l*. The outer Process of the *Os frontis*, forming the upper Part of the Orbit. *m*. The anterior Process of the *Os male*, joined with the *Os maxillare*. *nn*. The anterior Process of the *Os maxillare*, forming the Sockets of the foremost Teeth. *oo*. The lower lateral Process of the *Os maxillare*, constituting the Sockets of the Grinders. *p*. A Grinder in it's Socket, one on each Side. *q*. A surprizing Cavity of the Nose, stretching above the Palate, through which, by means of it's *Proboscis*, the Water, upon drinking, is conveyed to the Throat, in the Manner peculiar to the *Elephant*.

Fig. 53.

Fig. 53. A View of the Right Side of the Head.

a. The round Process of the *Os occipitis*, entering into the *Pelvis Atlantis*. *bb*. The occipital Bone of a monstrous Size. *cc*. The Lambdoidal Suture. *d*. The *Os petrosum* with the *Meatus auditorius*. *e*. The outer zygomatic Process of the Temple-bone. *f*. The *Sutura squamosa* of the Temple-bone. *g*. The *Os Sincipitis*. *h*. The outer Process of the *Os frontis*, forming the upper Part of the Orbit. *i*. The Bottom of the Orbit. *k*. The Hole of the optic and pathetic Nerves, pointed to by a prick'd Line. *l*. The upper Process of the *Os male*, joined with the outer Process of the *Os frontis*, constituting Part of the Orbit. *m*. The anterior Process of the same *Os male*, joined with the *Os maxillare*. *n*. The posterior lateral or zygomatic Process of the same *Os male*. *o*. Another zygomatic Process of the same *Os male*, peculiar to this Skeleton. *p*. A Hole near the foregoing Process. *Quære*, If to let a Nerve pass to the Teeth? *qq*. The anterior Process of the *Os maxillare*, constituting the Sockets of the Fore Teeth. *rr*. The inferior lateral Process of the *Os maxillare*, supporting the Socket of an upper Grinder. *ss*. A Grinder fast in it's Socket, one on each Side ; which is no small Argument that this Skeleton belongs to an *Elephant*, and not to the chimerical *Bebe-moth* of the *Rabbins* ; or the *Bekæmaeth* supposed different from the *Elephant* ; of which *Buxtorf*, the learned *Bochart*, and others have treated.

Fig. 54.

Fig. 54. gives the back View of the same Head.

a. The great Hole of the Occipital Bone, for the Passage of the *Medulla oblongata* to the Spine. *bb*. The *Processus globosi* of the Occipital

cipital Bone covered with a Cartilage, entering into the *Pelvis Atlantis*. *c.* The *Os sphenoides* (*cuneiforme*, or *basilare*). *d.* A peculiar and very remarkable *Sinus* of the Occipital Bone, deeper than an *Ostrich's* Egg, serving, in all Appearance, for the Insertion of the Muscles of the Neck. *ee.* The outer Surface of the Occipital Bone entire. *ff.* The Surface of the same Occipital Bone broken through, exhibiting deep winding Cells running on every Side. *g.* The *Os petrosum*, with the *Meatus auditorius*. *h.* *Quære*, If this be the Place behind the Ears, wherein *Elephants* are wont to be killed, and here damaged by the Knife? *i.* The outer zygomatick Process of the Temple-bone. *k.* The outer Process of the Frontal-bone, constituting the upper Part of the Orbit (of the Eye). *l.* The Bottom of the Orbit, and the Hole that gives Passage to the optic and pathetic Nerves, mark'd by a small Line. *m.* The upper Process of the *Os malæ* join'd with the Process of the *Os frontis*, and making up a Part of the Orbit. *n.* The posterior lateral or zygomatic Process of the *Os malæ*. *o.* Another zygomatic Process of the same *Os malæ*, peculiar to this Skeleton. *p.* The lower lateral Process of the *Os maxillare*, supporting the Socket of an upper Grinder. *q.* The transverse Process of the Maxillary-bone, or the greater *Os palati*, which is very short in the Skeleton of an *Elephant*; whose Tongue is scarce longer than a Man's Hand: Which leaves no room to doubt but this must be the Skeleton of an *Elephant*. *rr.* The upper Grinders, one on each Side, to which their Opposites answer in the lower Jaw: And as the *Elephant's* Grinders are commonly four in Number, this Circumstance is another Proof of our Opinion. *s.* The Passage from the Nostrils into the Proboscis, and ending in the *Fauces*, with the *Os vomer* very visible: though ill drawn by the Neglect of the Painter. *tt.* The anterior Process of the *Os maxillare*, constituting the Sockets of the Fore-teeth, which are to be expressed in *Fig. 57*.

Fig. 55. A Grinder, which seems to be the Left one of the lower Jaw, seen on the Outside. It weighs viij lb. 3ix. 3ij. Apothecaries Weight, or 10 Pound *Russian*.

It's greatest Length 12 Inches. It's perpendicular Height 5 Inches. It's Thickness, or Breadth, 3 Inches. 'Tis made up of above 20 transverse *Lamellæ*, a Finger thick, perpendicularly erect, lying close to one another, and it's Root composed of two Apophyses. *aa.* The plane Surface of the exerted Part of the Grinder, scarce making half the Length of the Tooth, contrary to what is observed in the Grinders of the upper Jaw. *bb.* The Ends of the transverse *Lamellæ*, terminating in the Surface of the exerted Part, and here of the Hardness of Stone. *cc.* The anterior *Lamellæ*, not extending to the exerted Part, and, perhaps, lying hid either in the Socket of the *Os maxillare*, or under the Gums. *d.* The anterior Apophysis or Root of the Tooth, not quite entire

entire. *e.* The posterior *Apophysis* or Root, broken as the foregoing.
f. A deep *Sinus* between the two *Apophyses*.

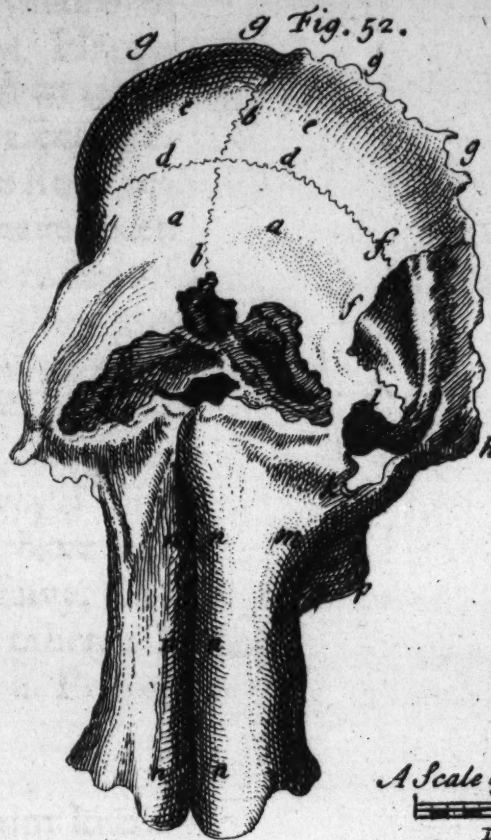
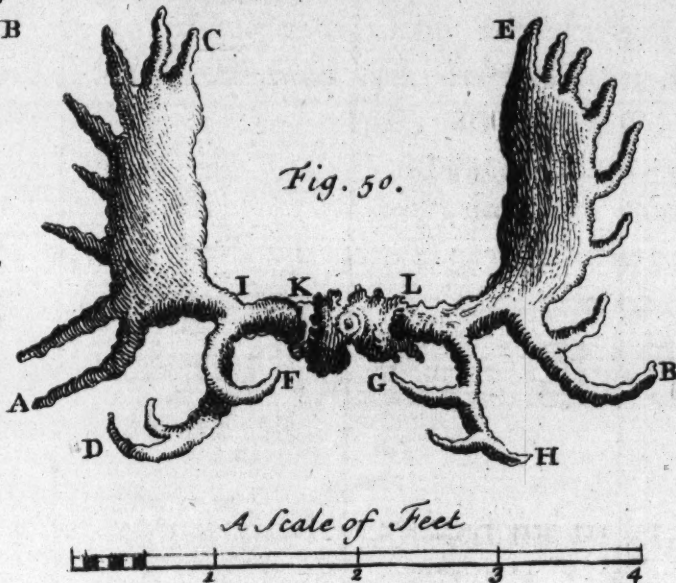
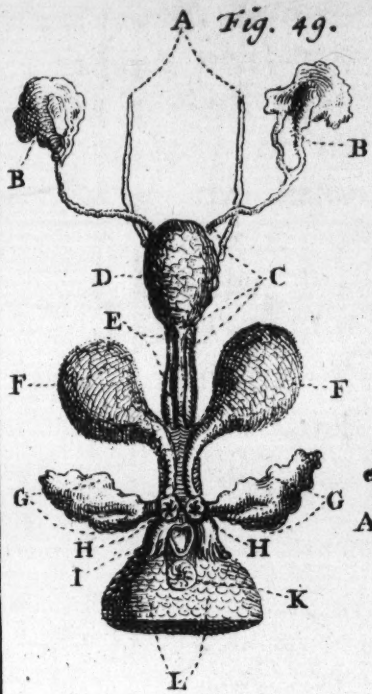
Fig. 56.

Fig. 56. The Tusk, by some improperly called the Horn, of the Right Side, having a twofold Direction by being bent outward and backward, which is peculiar to the Male *Elephant*, it being straiter in the Female. It is the *Ebur fossile* of the Shops, and weighs cxxxvii lb. 3j. 3ij. 3ij. Apothecaries Weight, or 160 Pound *Russian*. It's Length, or the exterior Circumference of it's back Part, was 136 Inches 5 Lines. The Circumference of the Root, where it got clear of the Socket, was the greatest, being 18 Inches, 5 Lines. The subtended Arch from one Extremity to the other, 55 Inches. The same subtended Arch *a c.* but bigger, 61 Inches. *a.* The Root hollow within, the Cavity extending beyond the Place marked *b.* *b.* The Root rising above it's Socket, where it was thickest. *c.* The Place where the subtended Arch was greatest, 61 Inches. *d.* The Point of the Tusk somewhat bent outward and backward, although this Curvature could not be expressed by the Painter in a visible Manner in the lesser subtended Arch of 55 Inches. The Tusk answering to the foregoing on the Left Side, was entirely like that on the Right, except the contrary Direction of it's Curvature, and it's less Weight on Account of having lost it's Point; for it weighed but cxxvii lb. 3vij. 3ij. Apothecaries Weight, or 150 Pound *Russian*: And this small Difference did not seem to deserve a separate Drawing.

Fig. 57.

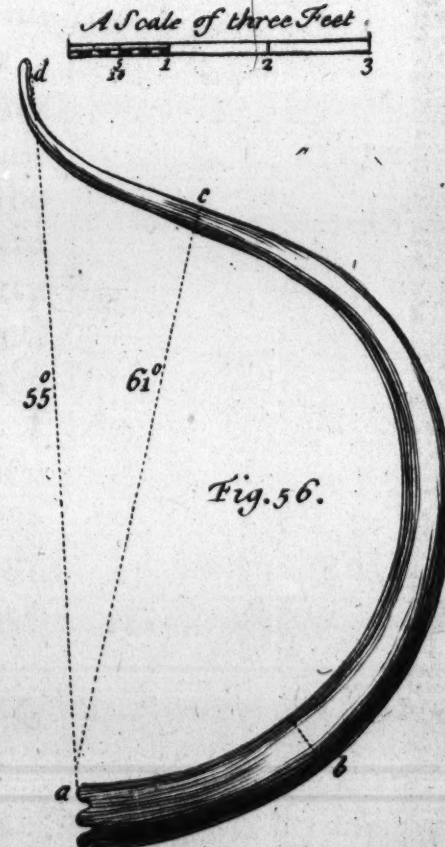
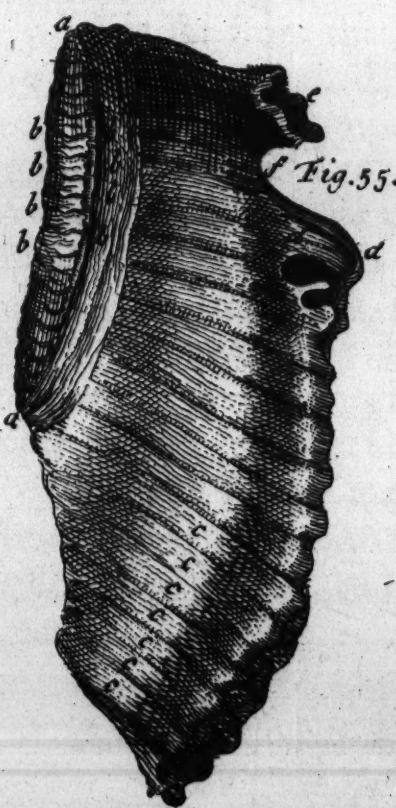
Fig. 57. The Right Thigh-bone, exhibited to View on it's inner Side, which turns towards the Body. It weighed xxj lb. 3vj. 3v. 3ij. Apothecaries Weight, or 25 lb *Russian*. It's perpendicular Length is 38 Inches, 5 Lines. The greatest Breadth of it's upper Head (or *Apophysis*) 11 Inches. It's Circumference at the Middle of the Bone, about 13 Inches. *a.* The Head covered with a Cartilage, placed on it's Neck, and inserted in the Socket of the *Os Ischium*, and fastened by means of two Ligaments. *b.* The *Cervix* or Neck of the Bone. *c.* The upper external or greater *Trochanter*. *d.* The lower internal or lesser *Trochanter*. *e.* The Place in the middle of the Bone, where the Circumference measured 13 Inches. *f.* The *Sinus* facilitating the free Motion of the *Patella*. *g.* The other Process or inward Head, covered with a Cartilage, together with it's Fellow. *h.* Two vertical *Sinuses* in the *Tibia* answering to the external *Trochanter*.

The Bones of this Skeleton, with the Ribs, *Vertebrae*, and others thereto belonging, were found in the sandy Side of a steep Hill, on the Eastern Bank of the River *Indigirska*, which falls into the Northern Ocean, not far from the Mouth of the Rivulet *Wolockoworuczei*. The River *Indigirska* to the East of the River *Jena*, where it runs into it's own Channel, has not been laid down by Mr *Wilsen*

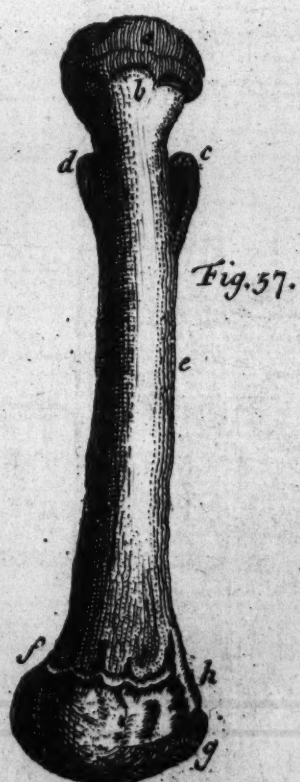


A Scale of 2 ancient Roman Feet
for Fig. 52. 53. 54.

A Scale of 4 Inches or 1/5



A Scale of 2 Roman Feet



in his Map of the N. E. Part of *Asia*: But it's Course is described by *Isbrand Ides* in the Map of his Travels. And some of these Bones are found now and then not only in these Parts, (which are so dangerous on Account of the excessive Cold, and continued Chains of inaccessible Mountains, that to us *Europeans*, who have the Happiness to live in a milder Climate, it would be present Death to travel through them) but likewise in the Sand-hills on the Rivers *Chatanga*, *Thomas*, *Tobol*, *Irtisch*, &c. which are all at a good Distance from the Sea; though neither *Elephants*, nor chimerical *Bebemoths*, have been ever seen in those Countries, nor could they live therein by reason of the Inclemency of the Air. Wherefore the best Judges follow the Opinion of the learned Dr *Woodward*, the *Scheuchzers*, and others, (whose Arguments, which are well known, and of great Weight among the *Literati*, I think needless here to repeat) in taking them for the Bones of Antediluvian Animals, or of such as were convey'd thither in the universal Deluge. And lest the Truth of what I have said above be called in Question by such Persons as are prone to Envy, Calumny, and Falshood, and detract the contrary Virtues in others; I thought proper to give a Copy of the original Certificate of a Person who was an Eye-witness to the digging it up.

WHEREAS Mr *Messerschmidt* intreated me to let him know where the Head of the *Mammoth* with it's Teeth and other Parts were found; as I was an Eye-witness to the digging it up, I thought proper to give him this short Account thereof in Writing: That Head was found by a certain *Russian* Soldier *Wasile Erlow*, on the Eastern Bank of the River *Indigirska*, not far from the Mouth of the Rivulet *Wolockowoi-ruçzei*. After it was discovered, I, being at Leisure, was present, and an Eye-witness to the digging up of this Skeleton or Bones. And further likewise, on the other Bank of the same River, which Bank is named *Sztanoijabr*, I saw a Piece of Skin putrified, appearing out of the Side of a Sand-hill, which was pretty large, very thick, and covered with long Hair, pretty thick set and brown, somewhat resembling *Goats* Hair: Which Skin I could not take for that of a *Goat*, but of the *Bebemoth*; in as much as I could not appropriate it to any Animal that I knew. This I certify by this *Latin* Testimonial for the present, and can safely, and even hold it my Duty to give a more circumstantial verbal Account thereof, whenever her Imperial Majesty shall be graciously pleased to lay her Royal Commands on me.

Signed,

Michael Wolochowicz.

Dated at *Irkutskoe*,
Feb. 10. 1724.

XXIV. *Albert Dürer's* Figure of this Creature has led several *Natural Hi-*
Natural Historians, since his Time, into Errors; for such have always story of the
copied *Rhinoceros*.

by Dr. Parsons.
No. 470.
p. 523.
Read June 9.
1743.

copied him; and indeed many have exceeded him in adorning their Figures with Scales, Scallops, and other fictitious Forms. Now, from the Badness of his Figure, I am induced to believe that great Man never saw the Animal; for he certainly could not have been so mistaken in the Performance. However, from the strictest Inquiry I was capable of making, it seems most probable, that a Sketch was sent to him from *Portugal*, by a Person who took it from a *Rhinoceros*, which was sent from the *East-Indies* to *Emanuel* King of *Portugal*, as a Present; and that *Albert* improved and embellished it into the original Drawing, which is in *Sir Hans Sloane's Museum*. The Inscription, in *German*, written under this Drawing, proves it very clearly, of which the following is a close Translation.

' In the Year 1513. upon the first Day of *May*, there was brought to our King at *Lisbon*, such a living Beast from the *East-Indies* that is called *Rhinocerate*: Therefore on Account of it's Wonderfulness I thought myself obliged to send you the Representation of it. It hath the Colour of a Toad, and is close covered over with thick Scales. It is in Size like an *Elephant*, but lower, and is the *Elephant's* deadly Enemy; it hath on the fore Part of it's Nose a strong sharp Horn; and, when this Beast comes near the *Elephant* to fight with him, he always first whets his Horn upon the Stones; and runs at the *Elephant*, with his Head between his fore Legs; then rips up the *Elephant*, where he hath the thinnest Skin, and so gores him: The *Elephant* is terribly afraid of the *Rhinocerate*; for he gores him always, where-ever he meets an *Elephant*; for he is well armed, and is very alert and nimble. This Beast is called *Rhinocero*, in *Greek* and *Latin*; but, in *Indian*, *Gomda*.'

The first Print published by *Albert Durer* himself has a *German* Inscription over it, somewhat differing from the manuscript one, of which the following is likewise an exact Translation, with the Date and Mark, as in *Fig. 58*.

Fig. 58.

' In the Year 1513 from the Birth of Christ, upon the first Day of *May*, there was brought to the most potent *Emanuel* King of *Portugal* at *Lisbon*, from *India*, such a living Beast. They call it a *Rhinoceros*: It is here represented in all it's Shape. It has a Colour like a speckled *Tortoise*, and is very closely covered over with thick Scales; and is in Size as an *Elephant*, only of shorter Legs, and very well armed. It has a sharp strong Horn forwards upon his Nose, which it begins to whet when it is near a Rock; therefore it is a conquering Beast, and the *Elephant's* deadly Enemy: The *Elephant* is greatly affraid of him; for, when he meets with him, the Beast runs at him with it's Head between his fore Legs, and rips up the *Elephant's* Belly, and kills him; for he cannot get rid of him: Besides, the Beast is so armed, that the *Elephant* can do nothing to him: They say likewise, that the *Rhinoceros* is swift, alert, and cunning.'

Many Years after this, one *Hendrik Hondius* published in *Holland* an exact Copy of *Durer's* Print counterfeiting the Date and Mark; but gives an Inscription in *Low Dutch*, nearly the same as that under the original Print.

Bontius * says, he has often seen these Animals in the Woods and Stables abroad, and values himself for having exhibited a Figure without the Decorations that *Albert Durer* put upon his; and yet, instead of the Hoofs which are proper to the Animal, he has drawn a *Paw* not unlike that of a Dog, only something bulky.

The Figure given by *Chardin* in his *Voyages* has some Truth, as to the Folds or *Plicæ* in the Skin of the *Rhinoceros*; and likewise as to the Feet: But in other respects it is not like the Animal. There is also a little Truth in the Figures of *Camerarius*; see his Emblems taken from Animals; but far from a thorough Representation of the Creature: And, in short, the other Originals, as that taken from the *Rhinoceros* in 1685, that published by *Carwitham* in 1739; and, to look back to the *Roman Times*, those in the Pavement of *Præneste*, and *Domitian's Medals*, are very inaccurate, but have none of *Albert Durer's* Decorations.

When that *Rhinoceros* arrived here in 1739. Dr *Douglas*, who let slip no Opportunity of improving Natural Knowledge, intended reforming the History of him, and therefore went frequently to see him; and, on *June 24* of this Year, exhibited before the *Royal Society* a Drawing of the same *Rhinoceros*, with a Collection of Figures of that Creature, taken from several Authors, who had written of him before. He mentioned also his Dimensions; and, on the 28th of the same Month, he produced a Collection of Horns, with some Account of them, but proceeded no farther. Since therefore another Occasion may not offer in many Years. I offer the following Account of the Male *Rhinoceros* that was shewed in *Eagle-street* near *Red-Lyon-Square*, in 1739, and the Drawings annexed to it.

In this Account I have had no Regard to those of other Authors, but have barely described him, as I have often seen him on purpose, both in the above-mentioned Place, and a long time after, when he was shewn at a Booth near the *London-Spaw*.

Humphry Cole, Esq; being Chief of the Factory at *Patna* in *Bengal*, procured this *Rhinoceros*, when young, and sent it to *England* by Captain *Atton* in the Ship *Lyel*, which arrived on the First of *June 1739*. The *Rhinoceros* was brought to *Eagle-street*, *Red-Lion-Square*, on the 15th of the same Month; and it was said by those who took care of him, that from his being first taken, to the time of his landing in *England*, his Expences amounted to One Thousand Pounds Sterling.

He was fed here with Rice, Sugar, and Hay: Of the first he eat 7 Pounds to about 3 Pounds of the Sugar; they were mixed together,

* *Bontius* calls this Animal *Abada*, which probably may be the *Javan Name*.

and he eat this Quantity every Day, divided into 3 Meals, and about a Truss of Hay in a Week, besides *Greens* of different Kinds, which were often brought to him, and of which he seemed fonder than of his dry Victuals; and drank large Quantities of Water at a Time, being then, as I was informed by his Keeper, two Years old.

He appeared very peaceable in his Temper; for he bore to be handled in any Part of his Body; but is outrageous when struck or or hungry, and is pacified in either Case only by giving him Victuals. In his Outrage he jumps about, and springs to an incredible Height, driving his Head against the Walls of the Place with great Fury and Quickness, notwithstanding his lumpish Aspect: This I have seen several times, especially in a Morning, before his Rice and Sugar was given him; which induces me to believe he is quite indomitable and untractable, and must certainly run too fast for a Man on Foot to escape him.

As to his Size, he did not exceed a young Heifer in Height; but was very broad and thick. His Head, in Proportion, is very large, having the hinder Part, next his Ears, extremely high, in Proportion to the rest of his Face, which is flat, and sinks down suddenly forward towards the Middle, rising again to the Horn, but in a lesser Degree. The Horn, stands on the Nose of the Animal, as upon a Hill. I have seen the Bones of a Head of one of these, in Sir *Hans Sloane's Museum*; and the Part on which the Horn is fixed, rises into a blunt Cone, to answer to a Cavity in the Basis of the Horn, which is very hard and solid, having no manner of Hollow nor Core, like those of other Quadrupeds. That of this Animal, being young, does not rise from it's rough Basis above an Inch high, is black and smooth at the Top, like those of the Ox-kind, but rugged downwards; the Determination of it's Growth is backwards, instead of strait up; which is apparent, as well in the different Horns of old *Rhinoceros's*, which I have seen, as in this of our present Subject; for the Distance from the Basis to the Apex of this, backward, is not within a third Part so long as that before, and it has a curved Direction; and, considering the Proportion of this Animal's Size to it's Horn, we may justly imagine, that the Creature which bore any one of those great ones that I have seen, must have been a stupendous Animal in Size and Strength; and, indeed, it were no Wonder, if such were untractable at any rate.

The Sides of his under Jaw are wide asunder, slanting outward to the lower Edge; and backward to the Neck, the Edges turn outward: From this Structure his Head naturally looks large.

That Part that reaches from the fore Part of the Horn towards the upper Lip, may be called the Nose, being very bulky, and having a kind of circular Sweep downwards towards the Nostrils: On all this Part he has a great Number of *Rugæ* running cross the Front of it, and advancing on each Side towards his Eyes.

The Nostrils are situated very low, in the same Direction with the *Rictus Oris*, and not above an Inch from it. If we look at him in a fore View, the whole Nose, from the Top of the Horn to the Bottom of his lower Lip, seems shaped like a Bell, viz. small and narrow at Top, with a broad Basis.

His under Lip is like that of an Ox, but the upper more like that of a Horse; using it, as that Creature does, to gather the Hay from the Rack, or Grass from the Ground; with this Difference, that the *Rhinoceros* has a Power of stretching it out above 6 Inches, to a Point, and doubling it round a Stick, or one's Finger, holding it fast; so that, as to that Action, it is not unlike the *Proboscis* of an *Elephant*.

As to the Tongue of the *Rhinoceros*, although it is confidently reported by Authors, that it is so rough as to be capable of rubbing a Man's Flesh from his Bones; yet that of our present Animal is soft, and as smooth as that of a Calf; which I have often felt, having had my Hand sucked several times by him. Whether it may grow more rough, as the Beast grows older, we cannot say.

His Eyes are dull and sleepy, much like those of a Hog in Shape, and situated nearer the Nose than that of any Quadruped I have ever seen; which he very seldom opens entirely.

His Ears are broad and thin towards the Tops, much like those of a Hog; but have each a narrow round Root with some *Rugæ* about it; and rises, as it were, out of a Sinus surrounded with a *Plica*.

His Neck is very short, being that Part which lies between the back Edge of the Jaw and the *Plica* of the Shoulder; on this Part there are 2 distinct Folds, which go quite round it, only the fore one is broken underneath, and has a hollow Flap hanging from it, so deep that it would contain a Man's Fist shut, the concave Side being forward. From the Middle of the hinder one of these Folds or *Plica*, arises another, which, passing backwards along the Neck, is lost before it reaches that which surrounds the fore Part of the Body.

His Shoulders are very thick and heavy, and have each another Fold downward, that crosses the fore Leg; and, almost meeting that of the fore Part of the body, just mentioned, they both double under the Belly close behind the fore Leg.

His Body, in general, is very thick, and juts out at the Sides, like that of a Cow with Calf. He has a Hollow in his Back, which is mostly forward, but, backwards, the Line or Ridge rises much higher than that of the Withers; and, forming the *Plica* upon the Loins, falls down suddenly to the Tail, making an uneven Line. His Belly hangs low, being not far from the Ground, as it sinks much in the Middle.

From the foresaid highest Point in his Back, the *Plica* of the Loins runs down on each Side between the last Ribs and the Hip, and is lost before it comes to the Belly; but, above the Place of it's being lost, another arises, and runs backward round the hind Legs, a little above

above the Joint: This I call the *crural Fold*, which turns up behind till it meets another transverse one, which runs from the Side of the Tail forward, and is lost before it reaches within Two Inches of that of the Loins.

The Legs of the *Rhinoceros* are thick and strong; those before, when he stands firm, bend back at the Knee, a great Way from a strait Line, being very round, and somewhat taper downwards. The hinder Legs are also very strong, bending backwards at the Joint to a blunt Angle, under which the Limb grows smaller, and then becomes gradually thicker, as it approaches the Foot; so also does that Part of the fore Leg. About the Joint of each of his Legs, there is a remarkable *Plica* when he bends them in lying down, which disappears when he stands.

In some Quadrupeds, the Fetlock bends or yields to the Weight of the Animal; but in this there is no Appearance of any such Bending, and he seems to stand on Stumps, especially if he is viewed behind. He has three Hoofs on each Foot forwards; but the back Part is a great Mass of Flesh, rough like the rest of his Skin, and bears upon the Sole or Bottom of his Foot.

This Part is plump and callous in the Surface, yielding to Pressure from the Softness of the subjacent Flesh. Its Shape is like that of a Heart, having a blunt Apex before, and running backward in a broad Basis. The Out-line of the Bottoms of the Hoofs are somewhat semicircular.

The Tail of this Animal is very inconsiderable, in proportion to his Bulk, not exceeding 17 or 18 Inches in Length, and not very thick: It has a great Roughness round it, and a kind of Twist or Stricture towards the Extremity, ending in a Flatness, which gave occasion to Authors to compare it to a *Spatula*. On the Sides of this flat Part, a few Hairs appeared, which were black and strong, but short: The Growth of these is seen in the Tail of the old *Rhinoceros*, described very well by Dr Grew, in his *Museum Regalis Societatis*, ' In this the ' Dock is about half an Inch thick, and two Inches broad; of what ' Length the whole, is uncertain, this being only Part of it, though ' it looks as if cut off near the Buttock: It is about Nine Inches, black, ' and very rough. On the two Edges, and there only, grow also very ' black and shining Hairs, a Foot long, stubborn, and of the Thickness ' of a smaller Shoe-maker's Thread: Yet not round, as other Hair, ' but rather flattish, like so many little Pieces of Whalebone.' It is further to be observed, that the Hairs on the Left Side grow out a great way up towards the Root of the Tail, (being shorter, as they are higher) like the Fibres of a Quill; whereas, on the Right Side, they grow no higher than the flat Part. There is no other Hair on any Part of this young *Rhinoceros*, except a very small Quantity, on the posterior Edge of the upper Parts of the Ears. I have observed a very particular Quality in this Creature, of listening to any Noise or Rumour

Rumour in the Street; for though he were eating, sleeping, or under the greatest Engagements Nature imposes on him, he stops every thing suddenly, and lifts up his Head, with great Attention, till the Noise is over.

The *Penis* of the *Rhinoceros* is of an extraordinary Shape: There is first a *Theca* or *Præputium*, arising from the Inguinal Part of the Belly, nearly like that of a Horse, which conceals (as that does) the Body and Glans, when retracted. As soon as the Animal begins to extend it, the first thing that is extruded, the *Theca*, is a second Sheath of a light-Flesh-colour, and pretty much in Form like the Flower of the *Digitalis floribus purpureis*; and then out of this another hollow Tube, which is analogous to the *Glans Penis* of other Creatures, very like the Flower of the *Aristolochia floribus purpureis*; but of a lighter or fainter Flesh-colour than the former. His Keeper, who was a Native of *Bengal*, would make him thus emit his *Penis* when he pleased, while he lay on the Ground, by rubbing his Back and Sides with Straw; and, in it's utmost State of Erection, it never was extended to more than about 8 or 9 Inches. It's Termination is backward in a curved Direction, so that he is a retromingent Animal, and consequently retro-generative. I have several Times seen him pissing; he turns his Tail to the Wall, and, extending his hind Legs asunder, crumps himself up, and pisses out in a full Stream as far as a Cow.

We need say no more of the Female *Rhinoceros*, that came over since, but that she is exactly like this in all respects, except the Sex; and, by the Horn, and Size, of the same Age; and the *Pudenda* like those of a Cow.

The Skin of the *Rhinoceros* is thick and impenetrable: In running one's Fingers under one of the Folds, and holding it with the Thumb at the Top, it feels like a Piece of Board half an Inch thick. Dr *Grew* describes a Piece of one of these Skins tanned, which, he says, 'is wonderful hard, and of that Thickness, exceeding that of any other Land Animal he has seen.' It is covered all over, more or less, with hard Incrustations like so many Scabs; which are but small on the Ridge of the Neck and Back, but grow larger by degrees downwards toward the Belly, and are largest on the Shoulders and Buttocks, and continue pretty large upon the Legs all along down; but between the Folds, the Skin is as smooth and soft as Silk, and easily penetrated; of a pale Flesh-colour, which does not appear to View in the Folds, except when the *Rhinoceros* extends them, but is always in View under the fore and hinder Parts of the Belly; but the Middle is incrustated over like the rest of the Skin. To call these scabbed Roughnesses Scales, as some have done, is to raise an Idea in us of something regular; which in many Authors is a great Inaccuracy, and leads the Reader into Errors; for there is nothing formal in any of them.

As to the Performance of this Animal's several Motions, let us consider the great Wisdom of the CREATOR, in the Contrivance that serves him for that Purpose. The Skin is entirely impenetrable and inflexible; if

therefore it was continued all over the Creature, as the Skins of other Animals, without any Folds; he could not bend any way, and consequently not perform any necessary Action; but that Suppleness in the Skins of all other Quadrupeds, which renders them flexible in all Parts, is very well compensated in this Animal by those Folds; for since it was necessary his Skin should be hard for his Defence, it was a noble Contrivance, that the Skin should be so soft and smooth underneath, that when he bends himself any way, one Part of this Board-like Skin should slip or shove over the other; and that these several Folds should be placed in such Places of his Body, as might facilitate the Performance of every voluntary Motion he might be disposed to.

I only beg leave to add one Paragraph more, wherein I shall attempt to settle a Point that concerns the double Horn mentioned by *Martial*,

*Namque gravem gemino cornū sic extulit ursum.**

And which has given many Critics a great deal of Trouble to alter, as believing either *Martial*, or his Transcribers, were wrong in that Sentence.

There is no where a greater Instance of the Uncertainties that Mankind may be led into from conjectural Reasoning, than in this very Subject of the *Rhinoceros's* Horn. And although the several Critics who have handled this Matter, shew abundance of Ingenuity in changing *Martial's* Reading; yet if we can make it appear, that there was a *Rhinoceros* with Two Horns on his Nose in *Rome*, then that *Poet* was right; if not, *Bochart* has the better, who has altered it thus:

Namque gravi geminum cornū sic extulit urum.†

The first Knowledge we had in this Part of the World of that Animal, was of the one that was brought from *Asia* to the King of *Portugal*, mentioned before; and as those brought into *England* since that Time, viz. that in 1685, our present Subject in 1739, and the Female *Rhinoceros* in 1741, were single horned; and as likewise the great Number of Horns that are to be found in the *Museums* of the Curious, brought from time to time from the *East-Indies*, are also single; we may venture to assert, that all those of *Asia* have really but one Horn upon the Nose: And this is confirmed by many Gentlemen, who had seen those Creatures in *Persia*, and other Parts of the East. From thence it is easy to conclude, that this was the Reason the single Horn was imagined the Standard of Nature for that Animal, and that therefore *Martial* ought rather to say, that two Bears, or (according to *Bochart*) two wild Bulls, were tossed by the strong Horn of the *Rhinoceros*; than that a single Bear was thrown up by his double Horn.

On the other Hand, we are sure, that the *Romans* had always a very great Commerce with the *Africans*, and had many Cargoes of wild

* *Martial*. Epigr. Libr. IV. Epig. 82.

† *Bochart*, Tom. I. Lib. 3. pag. 93.

Beasts from that Quarter of the World. Is it not therefore likely, that they might more conveniently have obtained the several *Rhinoceros's* that were shewed in that City, from *Africa* than *Asia*; since the Passage to *Italy* from the former is but a short one, cross the *Mediterranean Sea*; and that the Countries that produce those Animals in the latter, are so very remote from *Italy*? For we find the *Greeks* had no Knowledge of this Beast in the Time of *Aristotle*, nor since, that we know of; whereas the *Romans*, according to the Accounts given, have had Six; One shewed by *Pompey the Great*, One by *Augustus*, Two by *Domitian*, One by *Antoninus Pius*, and the last by *Heliogabalus*.

Now we do not want sufficient Proofs to shew that there is a *Species* of those Animals in *Africa* having Two Horns on the Nose. *Peter Kolbé*, a *Dutchman*, in his Voyage to the *Cape of Good Hope*, says, there is one on the Summit of the Nose, like the others, but having a smaller close behind it. There are also Two Horns in *Sir Hans Sloane's Museum*, sticking to the same individual Integuments, not much more than an Inch from each other; which is an undeniable Proof of the Existence of this *Species*: And, in fine, the Brass Medal of *Domitian*, which Mr *Folkes* was so kind to shew me, has, on one Side, the Figure of a *Rhinoceros* with Two Horns * upon the Nose very plain. From all which I cannot but be inclined to believe, that this Medal was struck from one of those of *Africa*; and that *Martial* had no more Notion of a *Rhinoceros* with One Horn, than *Bochart* had of one with Two.

There is one thing remarkable of *Albert Durer*: It is certain, from his Print of this Animal, that he, or somebody else, concerned in his Figure, thought that *Martial* was right; for it is plain, they were willing to add a Second Horn to the Figure, and being puzzled where to place the other, at last put it upon the Neck; by which it further seems probable that *Albert* never saw the Beast †; but was led by the Poet's Epigram to make that Addition to the Drawing sent to him from *Portugal*.

Augustini also, in his *Dialogue of Medals*, has a Figure of the *Rhinoceros*, with Two Horns on the Nose. So hath likewise the Figure in the *Prænestan Pavement*, made by Order of *Sylla* the Dictator, on which he certainly designed to represent several Animals, and other remarkable Things proper to *Africa*.

* *Pausanias's* Testimony is of great Force here, having seen them himself in *Rome*, brought thither from *Ethiopia*, with a double Horn on the Nose. His Words are:

Εἶδον ὃ καὶ ταύρους τὰς τε Αἰθιοπικὰς, ἃς ἐπὶ τῷ συμβεβηκότι ὀνομάζουσι ῥινοκέρας, ὅτι σφίσιν ἐπ' ἄκρα τῇ ῥινὶ ἐν ἐκαστῷ κέρας, καὶ ἄλλο ὑπὲρ αὐτὸ εἰ μέγα, ἐπὶ δ' ἡ κεφαλῆς ἐδὲ ἀρχὴν καὶ ἐκείνη.

Vidi etiam Tauros Æthiopicos, quos ex re ipsa Rhinocerotas nominant, quod illi e nare extrema cornu prominet; Et paulo superius alterum, non sane magnum, in capite nullum prorsus habent. Pausan. Lib. IX. C. 21.

† *Petrus Maffejus* makes this certain: He says, that the *Rhinoceros* that arrived in *Portugal* in 1513, was sent by the King to the Pope, and that the Ship which had him on board was cast away, and the Animal drowned on the Coast of *Genoa*.

Explanation of
the Figures.

- Fig. 59. *A side View of the Rhinoceros.*
 Fig. 60. *A fore View of the Rhinoceros fore-shortened.*
 Fig. 61. *A back View of the same, fore-shortened.*
 Fig. 62. *Two Views of one of the Feet. a, the upper Part of the Foot. b, the Sole of the Foot.*
 Fig. 63. *The Tail of an old Rhinoceros, in the Museum of the ROYAL SOCIETY.*
 Fig. 64. *The Penis in an erected State. a, The first Theca or Praeputium, of a dark Colour. b, The second Theca, being Flesh-coloured. c, The Tubular Glans Penis.*
 Fig. 65. *A Horn of a Rhinoceros, said to be Six Years old, being about 10 Inches long.*
 Fig. 66. *The Bottom or concave Basis of the same, to shew the Cavity is very superficial.*
 Fig. 67. *A beautiful Horn in Dr Mead's Museum, being about 37 Inches long.*
 Fig. 68. *The Horn of a Rhinoceros, in the Museum of Sir Hans Sloane, which (as those of Oxen are sometimes liable to Distortions in their Growth) differs from the common Form; it is 32 Inches long.*
 Fig. 69. *The double Horn mentioned above, belonging to Sir Hans Sloane: Whether they crossed each other on the Animal, is uncertain: It is most likely they did not, but that by drying they were crossed by the Corrugation of the Skin that joins them together: However I have drawn them as they appeared to me. The straight Horn is 25 Inches long, the curved one somewhat shorter, and the Two Diameters of the Bases 13 Inches.*
 Fig. 70. *The concave Bottoms of the above double Horns, as they adhere to the same Piece of Skin.*

*An Account of
the Bones of
Animals being
changed to a
Red Colour by
Aliment only.
By John Bel-
chier, Surgeon,
F. R. S. N^o
442. p. 287.
July & c. 1736.*

XXV. 1. That the Circulation of the Blood is carried on through the Bones, is evident from many Phænomena observable in Surgery; but that the Circulation is universally and intimately distributed through the most solid and compact Substance of the Bones (tho' hitherto by some made a Matter of Doubt) will appear undeniably from the Instances here produced; which are the Bones of several Hogs, of a different Breed, changed to a deep red Colour meerly by Aliment. And what makes this still more surprizing is, that neither the fleshy nor cartilaginous Parts suffer the least Alteration in Colour or in Taste.

The Diet with which these Hogs are fed is Bran, after it has been boiled in a Copper with printed Callicoës, in order to clean them from a dirty red Colour occasioned by an Infusion of *Madder Root*, which is made use of to fix the Colours printed on the Cloth; some of which Colours are made with Preparations from Iron, others with a Mixture of Alum and Sugar of Lead. The Parts printed with the Preparation of Iron

Iron produce Black and Purple; those printed with the Mixture of Alum, Red of different Degrees, according to the Strength of the Mixture. The Bran having absorbed the red Colour discharged from the Cloth, is mixed with the common Food of the Hogs, and produces this Effect on their Bones.

Upon examining these Bones, I observe in general the solid Parts to be most tinted, and the Teeth particularly, except the enamelled Part which is of a different Substance; and upon sawing them through, I find the internal Parts equally tinged, except at the Ends of the Bones, where the Substance is more spongy. And in order to discharge the Colour, I have macerated them in Water for many Weeks together; have boiled them often, and steeped them in Spirits, but all hath proved ineffectual; nor is the least Tincture given to any of the Liquids, in which I have made Experiments.

2. The first Experiment I made was upon a Cock, by mixing some of the *Madder Root* with *Fig-Dust*, on which they feed. The Cock dying within 16 Days after his first feeding on the *Madder*, I dissected him, and examined the Bones, not in the least Expectation of finding them tinged in so small a Time; but, to my great Surprise, found them universally of a Red Colour: So that, from this Experiment, it appears, that the *Madder* alone causes this Alteration.

A further Account by the same. N^o. 443. p. 299. Oct. 1736.

3. It is proper to observe, that *Mizaldus*, in a Work published in 1566, with this Title *Memorabilium, utilium ac jucundorum Centuriæ novem*, (Cent. 7. N^o) has these Words: 'Erythrodanum, vulgo Rubia tinctorum dictum, ossa pecudum rubenti & sandycino colore imbuunt, si dies aliquot illud depastæ sint oves, etiam intacta radice, quæ rutila existit, &c.'

Of the same, by M. Du Hamel du Monceau, F. R. S. &c. Translated from the French by T. S. M. D. F. R. S. N^o. 457. p. 390. July, &c. 1740.

I took 4 strong Pullers, which I shut up in Coops. I fed them with a Paste made of Wheat-meal and Powder of *Madder Root*; and gave them an Infusion of the same Root to drink, which I was in hopes they would have no Dislike to. The first Days they eat their Paste pretty well; but I found, that the Addition of the *Madder* rendered it much less agreeable to them than that made of the Meal alone, on which they fell with much greater Eagerness than on the other, when to try their Relish, I now and then gave them some of it. As to the Infusion of the *Rubia Tinctorum*, they never would drink it, and I was obliged to give them pure Water, which they drank plentifully; for this Root made them thirsty. In short, at the End of some Days they could not relish the Mixture, of which they eat but very little, and wasted away visibly.

On the 10th Day, one of them died; and another 2 Days after: and both of them had their Bones tinged of a Rose-colour. In order to prolong the Lives of the other Two, I diminished the Dose of the *Madder*, and from time to time I gave them the Paste without it. The Root had already produced it's Effect; for notwithstanding the new Regimen, they continued to waste; which obliged me to kill the Third 5 Days after the Death of the first 2. The Colour of it's Bones was not different from that

that of the 2, which died 5 Days before. As to the Fourth Pullet, which seemed not quite so sick, I marked it on the Leg with a Bit of Cloth tied round, and set it at Liberty. It recovered by degrees, by chusing Food to it's Taste in the Yard. But at the same time the Tincture it's Bones had received, went off gradually, and almost entirely disappear'd in a Month's time. For I took care to observe the Change every second or third Day, by looking at the Bones on the Under-side of the Wing, which have no other Covering than a thin Skin.

From this Experiment, as from that of Mr *Belchier's* Cock, it appears, that the *Madder-root* is alone sufficient to tinge the Bones of Animals red, which eat it. The Bones of my Pullets had taken no more than a Rose-colour; because these Creatures, being disgusted with their Food, never eat of it, but when urged by extreme Hunger: And I had never been able to tinge them of a fine red Colour, had I not repeated the Experiment on such Animals as I could feed with the Paste, and had it in my Power to make them swallow *Madder* in large Quantities.

For that Purpose I chose young Pigeons, the strongest of a whole Pigeon-house. Two of these had no other Food given them but Wheat-meal, others were fed with the Meal and *Madder* mixed and made into Pellets of a convenient Size, given them 3 times a Day till their Crops were full. I endeavoured to make the young Pigeons drink of the Infusion of *Madder*, which were fed with the Root and Meal; but I could never succeed, and was obliged to give them Water alone, as to the Pullets of the first Experiment. The Two young Pigeons fed with the Meal alone were lively and fat, digested their Food, and throve as well as if fed by the old ones. But, on the contrary, those that were fed with the Paste of Meal and *Madder*, took this Food only by Force, digested ill, were dull and very thirsty. And though Care was taken to keep their Crop constantly full, as well as the others, yet they grew leaner daily. They were always shivering, and endeavouring to get into the Sun, or near the Fire, to warm themselves: And the strongest of them was very sick by the 10th Day. I got the Two killed, that had fed on the Meal alone, as well as the others that had the *Madder* given them; and I preserved but Two, which appeared to me to have better borne the Effect of it than the rest, and had the Bones of the Wings already tinged red.

One of the two was intended to be recovered by a simple Diet, in order to see, if, by prolonging it's Life, the Colour, which was already very visible in the Wing-bones, would wear off: But in 3 Days time it was killed accidentally. However I thought I perceived the Colour weaker than before the Change of Diet: And the same Experiment, repeated some time after, confirmed me (in the Notion) that the Change of Food makes the Colour disappear by degrees. I continued to feed the other remaining young Pigeon with *Madder*, but in small Quantities for fear of killing it too soon. It lived 8 Days longer without any Appearance of the Bones being deeper coloured than the first that were killed.

All

All these Creatures, that had been fed with the Mixture, were dissected; and I made the following Observations on them.

Neither the Feathers, the Horn of the Bill, nor Claws, had changed their Colour, even where they are inserted into the Skin. The Skin of the whole Body had preserved it's natural Colour. The Brain, Nerves, Muscles, Tendons, Cartilages, *Epiphyses*, and Membranes, afforded nothing to the Sight contrary to the usual State of these Parts. But the long bony Tendons, that run along the great Bone, which is improperly called the Leg of Fowls, were red about the Middle of their Length, which is their hardest Part. All the true Bones, even to the very thinnest of them, were as red as Carmine; and in some Places this Red was so deep, that they appeared almost black.

In these young Birds, all the Bones do not take the red Tinge alike. The hardest are generally more coloured than those that are tenderer. A Difference of this kind is perceivable even in the same Bone; for the Middle, which has more Solidity than the Ends, is almost always the reddest. Not but there are sometimes found little pale Spots in the Part where the Red is deepest; and sometimes Spots of a very deep Red in those Parts which have taken but a Carnation Tinge.

I have always found, that the great Bone of the Foot, which is commonly called the Bone of the Leg, was visibly less red than the others. I have found the little Bones of the *Larynx* and of the *Apophyses* tinged of a fine Red, though these are as small as a Thread in young Pigeons. The Rings of the *Trachea*, which are entirely cartilaginous, had not taken the least Tinge; but the Ring nearest the Divison of the *Trachea* was red in these Pigeons; and even the first Ring of each Branch of the Bifurcation had in several taken the Tincture, in the Middle at least of it's Outside.

The other Parts of the Thorax, viz. The Heart, Lungs, *Mediastinum*, *Pleura*, and Diaphragm, remained of their natural Colour. There was nothing remarkable in the Liver, Spleen, Kidnies, nor on the Outside of the Gizzard; but the inner Membrane of the Crop and Intestines, especially the large ones, appeared red. Having washed Pieces of these Crops and Intestines, I found that their outer Membrane continued white, and that the inner, or *Tunica Villosa*, only was tinged by the *Madder*. At first Sight it appeared to me as if injected; but upon examining it with a Glass, I saw distinctly, that it was not a coloured Liquor that was contained in Vessels, as in Parts injected; but that it was only a sort of *Fæcula* detained in the villose Part of these Membranes. It is doubtless the Adhesion of these tinging Particles of the Root to the small *Villi* of the inner Membranes of the Organs of Digestion, that is the Source of all the Distempers with which these Creatures appeared to be seized, while I fed them with the *Madder*. Their Crop especially was relaxed and flabby, as if it had been macerated several Months in Water; it was easily torn, and it's inner or villose Membrane adhered so little to the others, that it was detached from

them in Pieces. It is very probable, that the coloured *Fæcula* detached from the *Madder*, that is, the Part of the Root which gives the Tincture, had obstructed the small Vessels and Glands of the Stomach, which might possibly occasion a *Sphacelus* therein. However that be, a certain Quantity of this *Fæcula*, being accumulated there, retarded Digestion, and those Animals died hectic, though with a full Stomach.

The Eyes of these Animals, while alive, seemed as red as those of some Parrots. I thought, after having dissected them, that no other Part was coloured but the *Capsula* of the Crystalline: But Monsieur *Morand*, to whom I had sent a Turkey fed with the *Madder*, observed that the vitreous *Capsula* was of a crimson Red, though neither the vitreous Humour nor the Crystalline were dyed: The Eye of this Turkey being larger than those of the Pigeons, the Hand that dissected it much more dexterous than mine, and the Anatomist more knowing, I willingly come into his Opinion. This then is the only soft Part, that is really tinged in these Animals; for I do not look on those Parts as such, which appear so only by their immediate Contact with those Parts that are charged with the Colour: Monsieur *Morand* having in the Notes he sent me of his Observations, confirmed all that I had before observed, there ought to remain no Doubt of what I have here related.

I come to the Examination of the Skeletons, and of all the coloured osseous Parts of my Pigeons; in order to compare them with the Skeletons of the two Pigeons fed with Wheat-meal alone without the *Madder*. The Bones of the first were, as I have said above, of a very lively Carmine-red, in some Places of a Crimson; and I have some of them of the Colour of yellow Oker; but whence this Difference arose, I could not discover. These tinged Bones being broken, while fresh, or before drying in the Air, seemed to me somewhat bigger and fuller of Marrow; but also more spongy, or of a looser Texture, and easier to break, than the white Bones of the Pigeons fed with Meal only. The Parts of these Bones that had the least Degree of Hardness, broke between the Fingers, which remained coloured from them: And this Tincture does not come from the Marrow, which continues in its natural State, like all the other soft Parts. The same Parts in the white Bones were not to be broken in this manner.

If we recollect, that the Pigeons fed with the Mixture of Meal and *Madder* are always in a languishing Condition, in a continual Decay; it will be easy to judge, that this is the only Reason why the red Bones must be not so well formed, nor so hard, as the white Bones of the Pigeons fed with good Aliments. But why are they bigger, and, as it were, puffed up? It is hard to suppose any other Cause of this, but the Interposition of the colouring *Fæcula* of the *Madder* between the *Lamellæ* of the Bones. These heterogeneous Particles hinder the immediate Contact of these *Lamellæ*; and thence proceeds the preternatural Increase of their Size, and their little Solidity. Upon viewing these Bones with a good Glass, their smoothest Surface appears bored with

with a vast Number of small Holes, in which the colouring *Facula* is perceived. And with a Microscope that magnifies still more, there appears a sort of Net-work of Fibres, which divide, and re-unite, to form this Net. Under the first Order of this Net-work, which appears white, another is seen somewhat red, and under this a third and a fourth, still deeper coloured: In fine, the Ground under all these reticular *Strata* is of a very deep Red; and the whole may be justly enough compared to a Piece of Wood stripped of it's Bark. It is probable, that this sort of Injection, made by the way of Digestion, might lead an able Anatomist to some very useful Discoveries on the Nature and Formation of the Bones. Nay I think I have already found out something new on this Head; but, as I have still some Scruple remaining on my Observations, I will not venture to communicate the Consequences drawn from them.

In order that the *Madder* should produce the above related Effect on the Bones, it's Tincture must have such a Degree of Fixity, (according to the Dyers Term) as not to be changed by the dissolving Action of the *Saliva*, of the Juice of the Stomach, of the pancreatic Juice, of the Bile, &c. nor by the peristaltic Motion of the Stomach and Intestines; and yet these Juices act so powerfully on common Aliments, that after Digestion they are not to be known either by their Smell, Taste, or Colour. This is not all: These colouring Particles must be small enough to pass with the Chyle into the Bood, and circulate with it through a great Number of Strainers or Vessels, without being separated, and without being deposited either in the Liver, Spleen, or Pancreas.

I strongly suspect that Portion of the Lymph of the Blood, which is fit for nourishing the Bones, might be the true Dissolvent of the Tincture of the *Madder*, and might convey it to the Place whither it carries Nourishment to the solid Parts of the Body of these Animals. In consequence of this Conjecture, which I shall resume in the Sequel, I thought that the Skeletons of young Animals ought to take a stronger and quicker Tincture, than those of full-grown Animals; because the Bones of young Animals are in a State of Growth, which requires a greater Quantity of osseous Juice. It is likewise true, as above said, that it is the hardest Bones of young Animals, that imbibe most of the Colour. All these Considerations gave Rise to a Difficulty, which was to be cleared up.

Wherefore, in the Beginning of last *October*, I chose Two Turkeys of the Year, the strongest I could find, and young Pigeons in their first Hair or Down. I could wish to have made the Experiment on Animals of the same Species; but it was impossible to find young Turkeys in their first Down at that Time of the Year: And besides, these Animals being extremely tender during the first Months, their Stomach would never have been able to bear the Effect of the *Madder*. As to old Pigeons, I had no tame ones: The wild are difficult to be

fed with the PASTE; and if they were suffered to feed at Discretion, they would not have been sufficiently maddened, if I may be allowed this Expression. However, the Bones of my two Turkeys were very hard, in comparison of those of the young Pigeons: And thus I had in these Animals, though of different Kinds, all that was of Importance for my Experiment.

My young Pigeons, fed with the PASTE mixed with *Madder*, died the third Day; yet all that had the Consistence of Bone in their Skeletons, was become as red as Scarlet. Mr *Belchier* was surprized to see the Bones of his Cock tinged red in 16 Days, and here are Bones so coloured in 3 Days. But all that should in Course of Time have turned to Bone in one of my young Pigeons, and as yet was but Cartilage, as the *Epiphyses*, the great *Apophysis* of the *Sternum*, &c. had not taken the least Colour. In the other there were some Spots of a very weak red on the Cartilage of the *Sternum*, which probably began to ossify. Other Experiments, since tried, have taught me with greater Certainty, that the Cartilages in general are not tinged red by the *Madder*, but when they begin to acquire the Consistence of Bone.

If, as I suspect, it is the lymphatic Part of the Blood that is the *Menstruum* of the colouring Particles of the *Madder*; if this Lymph contains the nutritious Juice of the Cartilages and Bones; why does it not, in carrying with it the colouring Particles it has extracted from the Root, why does it not, I say, tinge the Cartilages as well as the Bones? In my Opinion this Difficulty cannot be solved but by the Difference of the Pores. In the Cartilages they are too large, the colouring Matter passes through them too easily, and finding no osseous *Laminae* yet formed, for want of a Surface sufficiently extended to retain it, it passes with the superabundant Lymph through the Pores of the Cartilages. When these Cartilages begin to take a proper Consistence, where there are *Strata* of osseous *Laminae* already formed, the Obstacle exists, the colouring *Fæcula* is detained and deposited there. When the ossifying Juice is no longer necessary for repairing a daily Loss of Substance, as in Animals arrived at their full Growth; besides that probably this Juice is then much less abundant, and consequently, in proportion, less charged with the colouring Parts of the Root; it must necessarily result thence, that the Bones of an adult Animal will be much weaker coloured. And this is what happened to my two Turkeys, which, though fed for 15 Days with the PASTE of Meal and *Madder*, had their Bones tinged but of a Rose Colour, which appeared to me somewhat deeper towards the Ends than the Middle, which, having too much Consistence, could not admit or retain the same Quantity of the colouring *Fæcula* as the tender Bones of the young Pigeons. Therefore the Bones of Animals that are still growing, are dyed better and quicker than those of full-grown Animals; and, in my Opinion, for the Reasons already given. My two Turkeys had the same Aliments with the Pullets of the first Experiment, they fell into
a Decay

a Decay like those, and I was obliged to have them killed in 15 Days Time.

Here we see young Pigeons, whose Bones were dyed of a fine Carmine red in three Days; which is nearly the Time they must have for acquiring this Degree of Tincture. By other Experiments on young Pigeons of the same Age, I have found, that in 36 Hours their Bones were of a lively Rose Colour, and in 24 Hours they were at least of a Flesh-colour.

These last Experiments prove with what Expedition the Distribution of the nutritious Juice is performed in Animals of this Kind, which acquire all their Growth in a few Months; and how rapid the Distribution is, even in those Parts where the Blood's Circulation meets with the greatest Obstacle, as in the Substance of the Bones.

As one ought likewise to infer from these Experiments, that there are vegetable Medicines whose chief Tendency is to the Bones, and which consequently might remedy many of their Distempers, I looked on my self obliged to employ the *Madder* with this View; but not having it in my Power to raise Diseases of different kinds in the Bones of my Animals, I confined myself to the Examination of what Effect it would have in a Fracture.

I chose 4 very vigorous young Pigeons: A Thigh-bone of each of them was broken; the Reduction was immediately performed, and secured by a proper Bandage. Two of these Pigeons were fed with the Meal and *Madder*, and the other two with the Meal alone. These last, notwithstanding the Pain the Fracture must have given them, had always a good Appetite, and in 8 Days they began to walk with their Dressing, which was a little loosened. The others fell into the Accidents already mentioned, and died, one on the 10th, the other on the 14th Day. The two Pigeons that had recovered were killed, in order to compare the *Callus*.

That of the Pigeons which had not taken any *Madder*, was little, close, and very even: That of those fed with this Root, was large, spongy, and uneven: There shot out of it a sort of Vegetation: It broke between the Fingers, and crumbled into small Grains. It is true, that the State of Suffering of these Animals, occasioned by the Hurt, and increased by a Food improper for them, might retard the perfect Re-union of their Bones; yet I think it certainly results from this Experiment, and others which I suppress, because they prove nothing more, that the *Rubia Tinctorum*, taken inwardly, is rather prejudicial than beneficial in the Case of Fractures; and it is not without it's Use to know what is to be avoided.

The *Rubia*, probably, is not the only vegetable Substance that can change the Colour of the Bones; and yet I have tried the Log-wood, the *Anchusa* and *Curcuma*, without Success. In all Likelihood it must be a Substance less susceptible of Alteration; and it is well known, that

that the *Rubia* is of that Sort, seeing the Cloths dyed with this Root bear very well the Action of the Air, and that of boiling.

I have put the coloured Bones of my Animals to several Proofs: First, as Mr *Belchier*, to that of boiling Water, and of Spirit of Wine, without the least Change of Colour. It also resisted Soap-suds. A strong Lixivium of Salt of Tartar discharged a little of the Colour, and made it look brighter. Vinegar made it take a yellowish Brown and obscure Tinge. In fine, Alum-water discharged the Colour pretty considerably, and the Water remained somewhat vinous. Thus these Bones perfectly well resist the same Boilings as the Cloths dyed with the same Root; but the Air acts upon them much sooner than on these Cloths: For the Bones of the Pullets in the first Experiment, those of the Turkeys in the third, and those of the young Pigeons, that had eat of the *Madder* but 3 Days, became entirely white in less than a Year; and the reddest Bones lost much of their Colour. And I am of Opinion, that the Dew, to which I have exposed some of them for a few Days, will finish the whitening of them.

As there is a Sort of Analogy between the Nutrition of Animals, and that of Vegetables, I have not neglected trying, if the Tincture of the *Rubia* would introduce itself into the Vessels of some Plants; which would, perhaps, contribute much to lay open their Organization.

For the first Experiment, in which indeed I had no Hopes of Success, I planted two Bulbs of *Tuberoses* in Earth, with which I had mixed a good Quantity of *Madder*: But I found nothing, either in the Leaves, Stalk, or Flowers, but what was in the common and natural State. And this must have been so: For since it is only the Bones that take the Tincture in Animals, the *Tuberoses*, having all it's Parts soft, is in the State of an Animal without Bones: Such as a Leach, an Earth-worm, a Lamprey, which would probably continue in their natural State, whatever Quantity of *Madder* were given them, supposing it could possibly be done.

Wherefore I resolved to try the Experiment on a Tree. I planted a Paradise Apple-tree in a Box, which I had filled with Earth mixed with a great deal of *Madder*; and I covered the upper Surface of the Earth with a Layer of *Madder* two Inches thick. This Layer was renewed several times for near two Years that my Tree is under the Experiment; but I have not as yet been able to examine if it's Wood is coloured by this Root. In case the Experiment does not succeed, as it is very likely it will not, it will serve at least to expose the Vanity and Uselessness of all those Receipts and Processes of Vegetation, that are to be found printed in *Mizaldus*, *Porta*, and other more modern foreign Compilers.

Concerning a
Zoophyton,
somewhat re-
sembling the
Flower of the

XXVI. 1. At the North-End of the Island of *Barbadoes*, in *St Lucy's* Parish, is a Cave about 14 Feet long, and 11 wide: It's Bottom is a Basen always full of transparent Salt-water, it's greatest Depth about 3 Feet: In this Basen there is a Stone of about 4 Feet long, and 3 in breadth

Breadth, always covered with Water. From small Holes in the Sides of this Stone, at different Depths under Water, appear in full Bloom, at all Times of the Year, several seemingly fine radiated yellow Flowers, with thick-set distinct *Petala*: These Flowers*, upon the Approach of my Fingers, or when disturbed by any thing else that came within 2 or 3 Inches of them, would in an Instant close all their Leaves together, and the Flower, Stalk and all, would shrink back into the Cavity of the Stone; yet, if undisturbed for the Space of a few Minutes, they would again come in Sight, and by Degrees expand their Leaves, and appear in their former Beauty. From such an Appearance at first, I could give it no other Name but that of a sensitive Flower; especially when I once saw several *Stamina*, but without *Apices*, rise up from the Socket of the Flower. Yet no sooner had these appeared to give me the Idea of a perfect Flower, but that replete with Animal Life, if Motion, and a Capacity of Self-Preservation may be called such; these Claws, or Arms, which I must no longer call *Stamina*, darted from one Side of the Flower to another, and about it's Verge, with a quick Motion, as if in Search of Prey. What further confirmed me in this Opinion, was, that I observed these Claws, when in Motion, to be jointed, and that they would often close together, as so many *Forcipes*; though their Appearance was but for a short time, soon retreating and disappearing again in the Socket of the Flower. As this seems to me, if it is allowed to be an Animal, to be it's manner of taking it's Prey, I leave it to the Judgment of others to consider whether, as these radiated Leaves can in an Instant close, with a strong elastic Force, to avoid Danger, they may not also when the Prey is brought within their Circle, be of Use to confine and secure it in their Embrace, till it is conveyed to the Mouth; which I suppose to be in the Socket, of what I have at first called a Flower. The Top of the Stone, out of which these seeming Flowers do grow, is covered over with Clusters of Water-bottles, that resemble unripe Grapes. Among these I found also several small blue Flowers, resembling the yellow ones in their Form and other Qualities.

2. At first Sight this Species of Animals greatly resembles the Flower of the *Marigold*, but is of a paler Yellow. I take it to be a Sort of *Urtica marina*, of which *Gesner* has given Descriptions and Figures in his Book *de Aquatilibus*; but a Figure very nearly resembling this above described, is to be seen in *Johnston*, Hist. Nat. de *Exanguibus aquaticis*, Tab. XVIII.

XXVII. 1. In the 1st Chapter he discourses of Shells in general, and premises a Method of placing them in different Classes, which he reduces to 8, viz. *Tubulus*, *Cochlidium*, *Polythalamium*, *Lepas*, *Concha*, *Conchoides*, *Balanus*, and *Echinus*.

The 2d treats of *Polythalamiums*, which he defines a Tubulous Shell divided into several Cavities, conical, straight, or regularly spiral, with a Pipe, or Canal, passing through each Cavity. This again he subdivides

Marigold, by the Rev. Mr. Griffith Hughes, Minister of St. Lucy's Parish in Barbadoes, No. 471. p. 590. Read Nov. 10, 1743.
* Fig. 71.

A Remark by C. Mortimer, M. D. R.S. Sec. Ibid. p. 591.

An Account of a Book intitled, Jo. Phil. Breynii, M.D. &c. Dissertatio Physica de Polythalamis, nova Testaceorum classe, &c. Gedani,

1732, 4^{to}. Or
a Physical
Dissertation of
a new Class of
Shells, which
he files Poly-
thalmiums,
&c. with 14
Copper Plates.
By Richard-
Middleton
Massey, M.D.
F. R. S. and
Hon. F. C.
Med. Lond.
No. 430. p.
191. Nov.
&c. 1733.

vides into four, viz. 1. *Orthoceras*, 2. *Lituus*, 3. *Ammonia*, and 4. *Nautilus*.

The 3d treats of the *Nautilus* and *Nautilites*, which last he takes to be a Stone formed under Ground in the Cavities of the *Nautilus*.

The 4th is of the *Ammonia* and *Ammonites*.

The 5th is of the *Lituus* (which he names from some Resemblance it has to the *Lituus*, or *Crozier*, which the ancient *Roman Augurs* used in their Ceremonies) and the *Lituites* or Stone formed in it's Cavities under-ground. The Shell is yet unknown, but of the Stone he has given a curious Draught, as it appears in a Marble which was brought from *Oelandt*, an Island of *Sweden*.

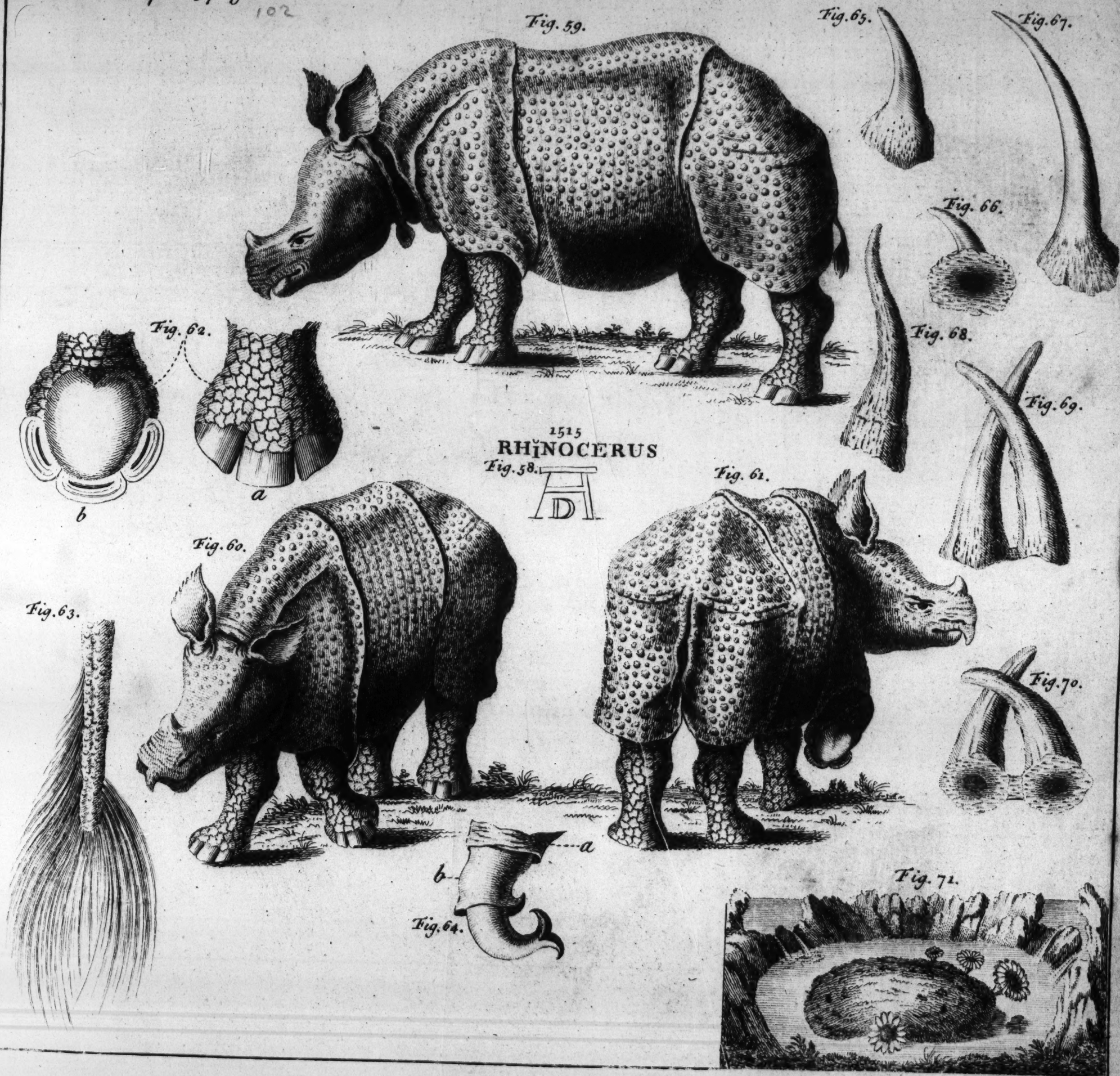
The 6th is of the *Orthoceras* and *Orthoceratites*, or stony Concretion in it's Cavity. Of these last Stones he produces 9 different Species, which he distinguishes chiefly by the Pipe or Canal, which runs thro' them.

In his Note concerning the *Belemnites Prussici*, of which he describes two Species, he takes notice that the stony Cone or Nucleus of it, is never found articulate, as in those that come from *Sweden*, and some other Countries.

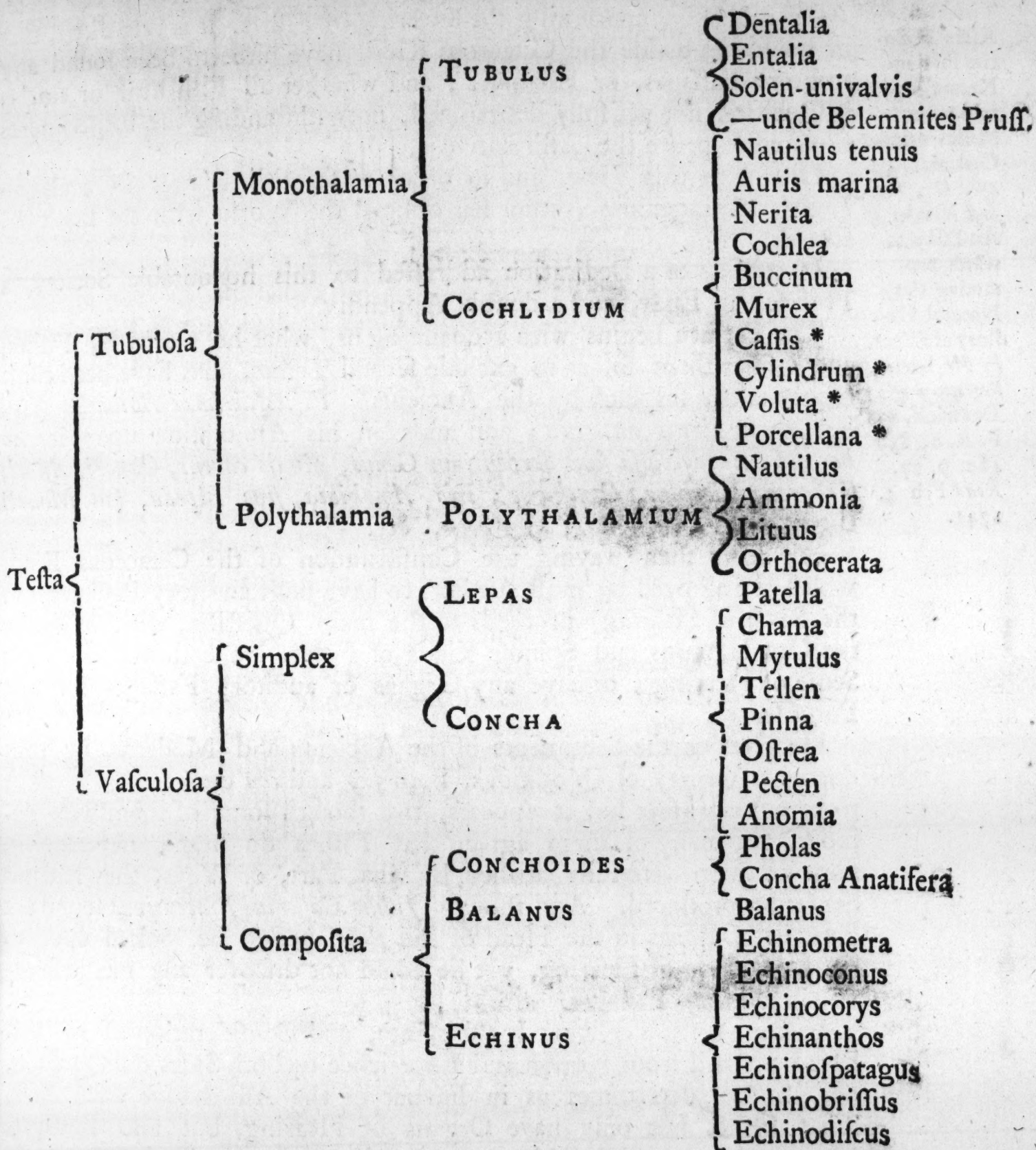
At the later end of his Book he proposes a methodical Distribution of the *Echini* and *Echinites*, or Stones that are generated under Ground in the Cavities of the *Echini*.

The whole Method he proposes for ranging Shells in general, may be seen in the following Table.

Tabula



Tabula Methodica TESTACEORUM.



An Account by
Mr John
Eames, F.R.S.
of a Book in-
titled, Jacobi
Theodori
Klein Histo-
riae Piscium
Naturalis pro-
movendæ
Missus primus
Gedani, 1740.
4^{to}. Or, The
first Number of
An Essay to-
wards pro-
moting the
Natural Hi-
story of Fishes,
by Mr Klein,
Secretary of
Dantzick, and
F. R. S. No.
462. p. 27.
Read Feb. 4,
1741.

2. Although the Natural History of Animals has been vastly improv-
ed, since several Members of the Royal Society, both at Home and
Abroad, have taken it under their Consideration; yet there still remain
some things to be known, in order to render it full and complete.
As particularly, concerning the Hearing of Fishes, it is remarked, that
in no Fishes beside the Cetaceous Kind, have hitherto been found any
auditory Passages, or Ear-holes; and whether all Fish hear or no, is
a Question not yet fully determined, notwithstanding the Experiments
alleged to prove the Affirmative.

'Tis with this View, and in order to set this Matter in a clearer
Light, the ingenious Author has obliged the World with the Book be-
fore us.

It consists of a Dedication addressed to this honourable Society, a
Preface, an Essay, and a double Appendix.

The Preface begins with acquainting us, what he means by Fishes,
and defines them so, as to exclude several Tribes, that have been com-
monly taken for such by the Ancients. *Pisces dicimus Animalia* (says
he) *apoda pinnis natantia*; and adds in his Annotation upon it, *Ab
hac definitione seclusa sunt Serpentium Genus, pinnis carens, Cancræ, Astaci,
Testacea; Cochleæ, Conchæve; imo Amphibia, sive Bipeda, (ut Manati
Clusii) sive Quadrupedia, ut Phocæ, &c.*

Mr Klein then (waving the Consideration of the Cetaceous Kind,
which are allowed by most Authors to have both auditory Passages, and
the Sense of Hearing) proceeds to the main Question, *viz.* Whether
the Cartilaginous and Spinose Kinds of Fishes are endowed with the
Sense of Hearing; or have any Organs or auditory Passages for that
Purpose.

He gives us the Sentiments of the Ancients and Moderns, by pro-
ducing a Variety of Quotations, both *pro* and *con* out of their Works;
from whence (says he) it appears, that though some of them were du-
bious, yet many of them agree, that Fishes do hear; nevertheless,
none of them were fully satisfied, by what Part, or Ways, they had this
Sensation produced. And though *Julius Casserius Placentinus* found out
some little Bones in the Head of the Pike, which he looked upon to
be the Organs of Hearing, yet he could not discover any manifest ex-
ternal auditory Passages.

In fine, from a diligent Inquiry into, and Consideration of all, that
hath been said from Reason and Experience on both Sides the Question,
our Author determines us in Favour of the Affirmative; and says,
That Fishes not only have Organs of Hearing, but also Passages,
(though they are difficult in many Species of them to be demonstrated)
by means of which a tremulous Motion is communicated to these Or-
gans. Nor does he think the Water in which they live, any Impedi-
ment, but rather the Medium, (or, as he calls it, the *Intermedium*) by
which Sound is communicated to them: As a Man shut up in one
Room,

Room, will hear and understand what is said in another, notwithstanding the Interposition of a Party-Wall.

He then proceeds to his Essay, wherein he considers what Parts in the Head of Fish serve for the Organ of Hearing, and by what Passages a tremulous Motion producing this Sensation may arrive at them. This Part of his Treatise he styles, *De Lapillis, eorumque Numero in Craniis Piscium*. These little Stones, sometimes called *Officula*, or little Bones, Mr Klein looks upon, and accordingly considers, as constituent or essential Parts in the Heads of Fish, and generated with the Brain itself. They differ (he says) in Magnitude, according to the different Size or Bulk of the Fish to which they respectively belong, and are easiest to be discovered in Heads of the Spinose Kind.

There are in all kinds of Fish 3 Pair of them; the first are the 2 largest Bones, and are easily enough found; but the greatest Difficulty lies in discovering the other two Pair, which are small, and lie enveloped in distinct little Bags, or a fine sort of Membrane. These he takes to be the auditory Organs, and answer to the *Incus*, *Malleus*, and *Stapes*, in other Animals: And he thinks by a diligent and careful Inspection, we might determine the Age of Fishes, by the Number and Thickness of the *Laminae* and *Fibres* of these Bones, as we can the Age or Growth of a Tree, by the Number of Circles in the woody Part of it's Trunk.

The Passages by which a tremulous Motion producing the Sense of Hearing, may arrive at these auditory Organs, are what our Author next enquires after; and he produces first a Specimen in the spinose Kind, viz. in a *Pike*; and upon Inspection into the Head of this Fish, he observes several Holes, which, by means of Hogs Bristles, he finds lead directly to these auditory Bones before described.

In dissecting the Head of a *Sturgeon*, (as a Specimen of the cartilaginous Kind) he traced the auditory Duct as far as the Membranous Body in which the three Pair of little Bones are placed.

But as our Author has obliged us with an exact Delineation of these auditory Ducts or Passages, as well as the Figures of a Variety of those *Lapilli* or *Officula*, from different Sorts of Fish, on several Copper Plates, to these I must refer, for a more satisfactory Idea than can possibly be given in Words.

We therefore proceed to the first Appendix, which entertains us with the Anatomy of a *Porpefs*. This Fish our Author in the Title Page styles *Tersio*, the usual Name for it in *Pliny*; but he calls it *Phocæna* in the Appendix, the Name used for it by *Aristotle*.

'Tis ranked amongst the cetaceous Kind, and is the smallest Fish in that Tribe, seldom exceeding 5 Feet in Length; in which it differs from *Dolphins* (amongst which Species it has by some been improperly reckoned) for they often exceed 10 Feet in Length. The Snout also of the *Dolphin* is much larger than in the *Porpefs*, which is another thing sufficient to distinguish them. It would be needless here to give

a Detail of the Anatomy of this Animal, which is so largely done by Dr *Tyson* in his *Phocæna*. I shall therefore only take Notice of some Remarks made by our Author upon the Dissection of a *Porpeß*, by the accurate Hand of Dr *De la Motte*, at Mr *Klein's* Request.

In the first Place, the *Meatus Auditorius* was found by both to be 2 Inches distant from the exterior *Canthus* of the Eye, forming a very small Hole (lest the Water getting in might prove an Inconvenience to it). He then gives us an Account of the *Os Petrosum*, and other auditory Organs, with curious Figures of them; in order to correct Mr *Ray*, who says *, *We observed not in this Fish any Ear-boles or Meatus Auditorii at all, wherein also Aristotle agreeth with us.*

A second Remark is, that though the *Porpeß* has no *Vesicula fellea* or Gall-bag, (and from thence most Authors have been induced to believe no Gall) yet Dr *De la Motte*, upon a more exact Scrutiny, finds a Duct that arises with a great Number of Branches in the Liver, and tending downwards, joins itself to the Pancreatic Duct; and these two so united together, form a Canal or common Duct, about 4 or 5 Lines long, before they discharge their Contents into the *Duodenum*. From whence it appears, (says Dr *De la Motte*) that the *Porpeß* has always a Discharge of Bile into the *Duodenum*, though 'tis but thin and diluted, and such as in other Animals is usually called Hepatic Bile.

In dissecting the *Os Petrosum*, several Worms were found: Some of these Mr *Klein* has presented us with a Figure of, as also of the Parts of Generation proper to the Male *Porpeß*, and lastly the Thoracic Duct in it's natural Dimensions.

Our Author concludes with some Observations made on the Heads of two *Raiæ* of an uncommon Species, and which he says are no where described. He gives us the Figures of the auditory Organs, with the Jaw of one of these Fish very accurately depicted in his vith Table.

And having considered the auditory Organs, with the Seat of them both, in the Cetaceous, Cartilaginous, and Spinose Kinds of Fishes, it appears, says our Author, that these *Lapilli* or *Officula* differ from one another both in Structure and Substance; for in cetaceous Fishes, whose Skeletons are truly bony, and which, in certain respects, may be compared to truly Lignous Trees, both the *Os Petrosum*, and auditory Organs, are in these, as in other Animals, perfectly *osseous* or bony: Whereas the cartilaginous Fish, whose Skeletons are elastic and cartilaginous, they may be compared to the *Keratophyta*, Species of Sea-Plants; and these Fish, instead of an *Os Petrosum*, have something analogous, but cartilaginous; and the auditory Bones are of a tartareous Kind of friable and easily macerable Substance.

* See Vol. II. Chap. vi. §. 86.

[The following Paper belongs to Section VIII.]

10. After I had, without Success, made several repeated Searches for the *Polypus*, in several Fish-Ponds, and a small Stream in my Parish, I applied myself to collect the different Insects of various Sorts I had there met with, and which were of more than 30 Kinds, all which I put together; but some of them voraciously seized upon others, and devoured them, so that in a Day's time I had hardly any left, but a few of one Sort, which rolled themselves up like *Millepedes*, or *Hog-lice*, but were, upon the whole, more of the *Leech* Kind, and could extend themselves about an Inch in Length. These I cut asunder, but the Pieces died in about 30 Hours after the Operation. I then recollected, that, in the Account published by Dr Mortimer, Mention is made of a *French* Gentleman, that had discovered *Water-Worms*, that would live after cutting: I searched for all I could find fastened either upon rotten Wood, Leaves, Straws, or Stones, that I took out from the Bottom of the Water, and cut of every Sort asunder; but none lived above 48 Hours, except these I here send you. In one Glass are 4 Pieces that now seem to be compleat Worms, and the same as the two in the other Phial: These 4 Pieces, 12 Days since, were 2 Worms: I cut them asunder with my Penknife, and found that each Part, from the first, continued vigorous and strong; and I could, by my naked Eye only, see that in three Days the Ends where the Wounds were given, were grown sharper, and that they moved along like the entire Worms.

Concerning
some Worms
whose Parts
live after they
have been cut
asunder, by
the Rev. Mr
Thomas Lord,
No. 470. p.
522. Read
June 9, 1743.

See above.

The 2 entire Worms here mentioned to have been contained in one of the Phials sent up by Mr Lord, were each cut presently after into two Pieces, which soon after compleated themselves, grew longer, and were several Weeks after in a vigorous and thriving Condition.

CH A P. II.

The Structure, External Parts, and common Teguments of the Body.

A Girl now 8 Years old, had Swellings in her Joints, and all over her Body some Years ago. Various Remedies were applied by her Parents, chiefly such as were domestick or empirical. A remarkable Tumour then arose in her Back between the Shoulders, which they endeavoured to discuss by topical Applications. In this they succeeded; but from that Time there gradually appeared a dry hard Crust, chiefly on the Palms of her Hands and Soles of her Feet, and came out also from the Ends of her Fingers and Toes, obstructing the Use of them, and rendering her incapable of either standing or walking. This Crust fell off at Times, especially after the Use of various Ointments by her Parents, but she was so much the worse.

A remarkable
cutaneous Dis-
order, by
Abr. Vater,
Prof. Anat.
& Bot. Wit-
temberg,
F. R. S. N^o
440. p. 199.
Jan. &c.
1736.

worse, grew bloated, and felt inward Disorders and Gripings, which did not cease till the Crust grew again. When that returned, she had no other Complaint than the Loss of the Use of her Hands and Feet. She was then put under the Care of a Surgeon, who gave her mercurial Purges, and Decoctions to purify her Blood, to which the Disease yielded again, and the Clearness of her Skin returned, so that she is now in a perfect State of Health ; but whether it will continue, Time must shew. I received from Mr *Harnisch*, who sent me this Account, a Piece of the Crust, and a Bit of it, that fell from the End of one of the Fingers. It was of such a Length and Thickness, that it appeared like the last Joint of the Finger, and the more so, as a Piece of the Nail stuck to one Side of it. This Crust being viewed by the Microscope, plainly appears to be composed of little Scales, so that it is certainly the very Cuticle expanded and hardened by a viscid and tartarous Nourishment. The same Gentleman also mentions a young Woman, who for a long Time has shed such a Crust twice every Year, from her Hands, Feet, and Elbows. She has not yet received the least Benefit from any Medicine. She has indeed an Obstruction of the *Menses*, which may be looked upon as the Original of her Disorder.

C H A P. III.

The HEAD.

A remarkable Cure performed by John Cagua, Surgeon, at Plymouth-Dock, of a Wound of the Head complicated with a large Fracture and Depression of the Skull, the Dura Mater and Brain wounded and lacerated. N^o 458, p. 495, Sept. &c. 1740.

I. JUNE 11, 1729, I was sent for to Mr *John Darton* of *Stonehouse* near *Plymouth*, to see his Son, aged 10 Years, who fell down from the Top of an old Wall, as he was taking out a *Sparrow's* Nest, upwards of 20 Feet high, in an ancient Building belonging to the Honourable *Richard Edgecombe*, Esq; When I came, I found him speechless, comatose, bloated Eyes, a wan Face, bleeding at the Nose and Ears, and a great *Hæmorrhage* and Vomiting : On Examination, a large, long, deep, and contused Wound appeared, from the Eye-brow all over the Left Side of his Head ; and after having shaved him, was surprised to feel, with my Fingers, so many rugged Splinters of the *Cranium* confusedly depressed through the *Dura* and *Pia Mater* into the Substance of the Brain ; the Extremities whereof appearing above the *Dura Mater*, I extracted to the Number of 5, besides several other Bits and small Pieces. In taking out the last Splinter, being Part of the superior and interior Part of the Orbit, containing some of the Basis and inferior Part of the *Os Frontis*, joining by the *Sutura Transversalis* to the superior Part of the *Os Male*, with Part of the said Suture, and the upper Extremity of the *Sphenoides*, almost to the lower End of the *Sutura Coronalis*, and *Squamosa* : This Splinter was the major Part of it depressed under the superior Part of the

the great Depreffion of the *Os Frontis* ; on extracting of which, 2 Parts or Pieces of the Substance of the Brain, with clotted Blood, came out with it, one as big as a large Kidney Bean, and the other as a large Pea ; at which Time the Patient fainting and vomiting, brought up most of what was contained in his Stomach, mixed with bilious and bloody Matter. The *Dura Mater* was very much contused, lacerated, and bare, upwards of $3\frac{1}{4}$ Inches, in Length, and at one End $1\frac{1}{2}$ Inch over, the Remainder about 1 Inch, and the Edges rugged: From the upper Part of the Fracture, there was a Depreffion of the *Os Frontis*, which reached up to the *Sutura Sagittalis*, nigh the *Coronal Suture* : One Part of the *Cranium* lapt over the other, which I sawed off on the Third or Fourth Day, it being an Inch long, and occasioned me a great deal of Trouble, before I could raise it up with my Elevator, the inferior Part of the Fracture being so thin and weak : The depressed Part terminated in a long Fissure about an Inch behind the *Coronal Suture* in the *Bregma* : The *Scalp* was so much contused and lacerated, that the next Day it began to mortify, which obliged me to lay all that Side of the *Coronal*, and the greatest Part of the *Bregma*, home to the *Lamdoid Suture*, bare, from the upper Part of his Head down to his Ear : The *Dura* and *Pia Mater* were very livid, and insensible to the Touch, except those Parts where the Brain was wounded, in the dressing of which the Motion or Pulsation of the Brain was very strong, and sometimes to that Degree, that it would rise considerably above the Surface of the *Cranium* ; which obliged me to keep it down sometimes more than 2 or 3 Minutes with my Fingers, and a large and thick Sindon dipt in a warm detergent Lotion, before it would cease, introducing it between the *Dura Mater* and the Edges of the Fracture. The upper Eye-lid in a Week's time impostumated, and formed a large Tumour as big as a Hen's Egg, which I opened, and kept it so a considerable Time, because I had therefrom a plentiful Discharge of Matter, which was at first very fetid, but afterwards became laudable, giving likewise a good Discharge from the wounded Brain through the Fracture of the upper Part of the Orbit. In about a Fortnight's time I had a very laudable Suppuration from all the Wound, and the Symptoms ceasing, the *Dura Mater* began to regenerate, looking very red and fresh ; the livid and lacerated Parts flust off, and the Extremities of the Fracture began to throw out their Ossifications from the *Diploe* and both Tables of the *Cranium*, like small Excrescences, or proud Flesh, which in a Month's time spread over the whole Fracture ; and I made my Observation, that it grew harder sooner at the Extremities of the Fracture than in the Centre. The Motions or Pulsations of the Brain still continued, and were very visible for a long Time after, and were felt for some time after the Wound was cured ; especially in the inferior Part of the *Coronal* and *Bregma*, over the inferior Part of the *Coronal Suture*, nigh the *Squamosa*. Except the 3 or 4 first Days the Boy continued very sensible ; but during the first 6 Weeks would very often complain of a violent Pain in his Head, attended with a *Coma* and Fever ; but would soon go off again,
by

A remarkable Cure performed by Mr Cagua, Surgeon.

by giving him an emollient and laxative Clyster, or a gentle laxative Draught. The 6th of Oct following, before his Wound was quite well, he was taken very ill with the Small-Pox, of the Flux-kind, and though he had them very severe, and was delirious in their coming out, yet he recovered. Nov. 11. following, the Wound was perfectly cured; but in the latter End several Exfoliations were taken out of the upper Part of the *Coronal*. He is now, and hath been ever since, very well, strong and healthy; has his Sight in both Eyes, is a very sensible and forward Lad, for his Age, and has been upwards of 4 Years at Sea, in his MAJESTY's and the Merchants Services.

Fig. 72.

Fig. 72. Represents the Boy's Head, with the Wound, as it appeared to View, and Part of the Cranium laid bare.

Fig. 73.

Fig. 73. Represents the Skull, with the Fractures made in it, and the several Splinters that were taken out.

A Is the external Part of the Splinter, adjacent to the superior Part of the *Os Malæ*, and the upper Part of the Orbit, in it's proper Bigness and Figure. 1. Is the thick Protuberance of the Basis and inferior Part of the *Os Frontis*, broken off and separated from the superior Extremity of the *Os Malæ* in the transverse Suture. 2. Is the lower Part of it broke off from the upper Part of the *Os Sphenoides*. 3. Is Part of the *Sutura Transversalis*. 4. Is the Diploe, and it's Thickness, being very rugged and irregular

B Is the internal and concave Parts, with the Thickness of the same Splinter. 1. Is Part of the Concavity of the upper Part of the Orbit. 2. The superior Part, with it's Thickness and Diploe. 6. and 7. The external and internal Tables. 3. The inferior and internal Part separated from the *Os Sphenoides*: The Middle of it is a deep Concavity. 4. A rugged Ridge arising from it's Cavity, and likewise from the great and middle one. 5. The internal and concave Part. 8.8. Part of the *Sutura Transversalis*.

C Is Part of the inferior and Basis of the *Os Frontis* and Bregma, with some of the lower Part of the *Sutura Coronalis*; being very thin in the Middle where the Suture is, it shews it's proper Bigness and Figure. 1. The Diploe.

D. D. D. Three other Splinters in their proper Bignesses and Figures. 1. 1. 1. The Diploe and both Tables.

E The Splinter that lapt over the Depression, which was sawed off.

The Case of a Wound in the Cornea of the Eye being successfully cured

II. A young Woman about the Age of 15 Years, Nov. 6. 1733, received a Wound just in the Pupil of her right Eye, by the Spear of a common Fork. An Inflammation followed, with great Pain. The whole Eye appeared dark and turbid; and the Humours seemed confused, and



Fig. 72.

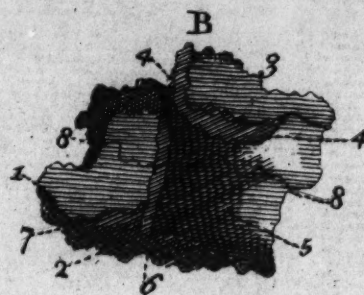
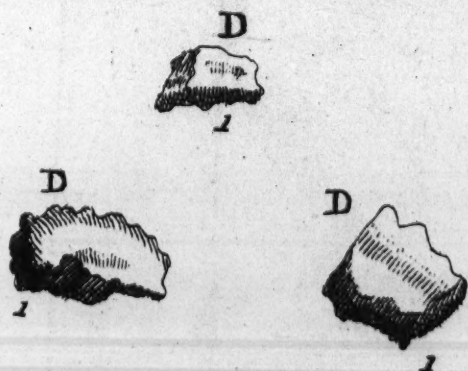
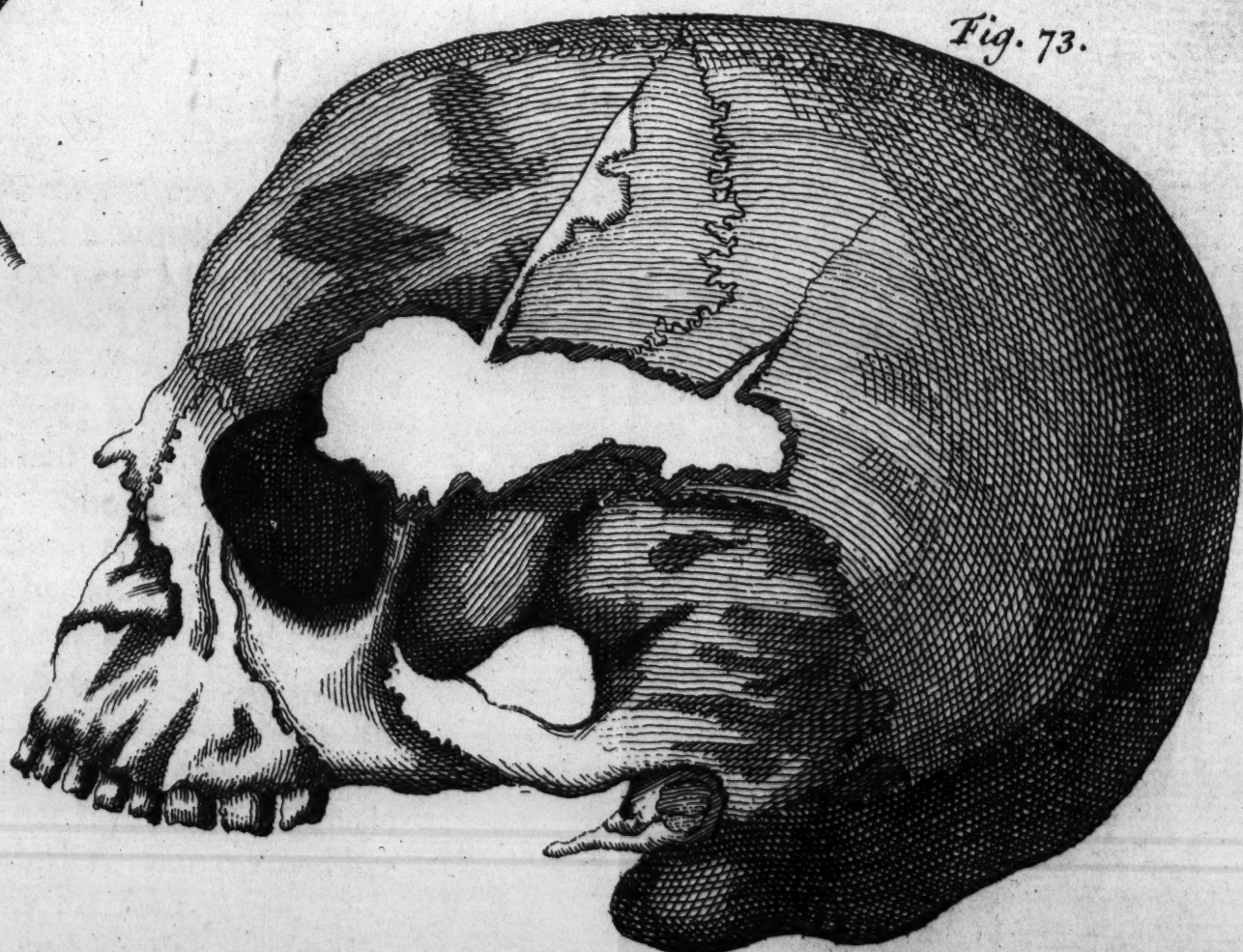


Fig. 73.



and blended together. I opened a Vein in the Arm, and drew away 10 Ounces of Blood: I then washed the Eye with a Collyrium of *Trochisci Albi Rbas*, and common Water, made Blood-warm; and dressed it with a Cataplasim of white Bread and Milk, with a little Saffron in it. The next Day there appeared on the wounded Part of the Cornea, a large thick Slough: I dressed her in the same Manner, and so continued till the 18th Day of the same Month, when the Slough cast off. I purged her during this Time with *Decoct. Sennæ* ʒij, *Mann. Solut.* ʒss, *Aq. Pæon. comp.* ʒij; *m. f. Pot.* at the Distance of about 3 Days, just as I found her Strength would permit. The Inflammation and Pain abated daily. During the whole Time, the Eye was quite blind, till the Slough cast off, when she complained she saw double. In a very little time her Sight returned, but not so perfect as before; her Eye having somewhat of a Cloud before it.

by Mr Tho. Baker, Surgeon to St Thomas's Hospital, N^o 453, p. 135, April 1739.

I made her 6 Visits, at the Distance of 2 or 3 Days after the 18th: When I left her, she saw perfectly well, that Cloud which she before complained of, being removed, her Eye appeared fair and clear; and, as she told me, was equally strong and useful to her as her other. A little Speck (which was the Cicatrix of the Wound) remaining on the Cornea, I made her a Fontanel in the Arm, and ordered her to keep it open, and not to touch the Speck on her Eye. It is now more than 2 Years since, the Speck has gradually decreased, and is now so small, that it is scarce visible; and her Sight is as perfect and strong as before this Accident.

III. June 7, 1732. M. Guilliminet, Counsellor of the Court of Aids, went hence to *Balleruc*, (whither I had been called to attend a Patient) with a Nun his Daughter, about 30 Years of Age. This Lady was troubled with as singular a Disease as I have heard of. 'Twas an intermitting periodical Palsy of the Eye-lids, which began every Evening about 6, with a Defluxion from the great *Canthus*, of a whitish Matter of some Consistence; so that she remained blind till next Morning, and then recovered the Use of her Eye-lids as before. This Disorder held her since *February* last, from which Time all Remedies ordered her by her Physician proving ineffectual, she was sent to *Balleruc* for the Benefit of the Waters. As we lodged in the same House, I had a fair Opportunity of observing the Effects the Waters had on her. She was pumped on the back Part of her Head and Neck 7 times, without receiving any sensible Benefit: The ninth time her Disorder seized her an Hour later than usual, and the Defluxion was less and thinner. The next Evening it retarded two Hours, and the following Night she had as much Command of her Eye-lids as ever. She took the *Douche* (for so we call that way of pumping) the next Morning and Evening and was entirely cured. I sat with her an Hour that Evening, carefully observed her Eye-lids by Candle light, and asked her several Questions on her Disorder. She opened her Eyes as well as I did mine, and set out the next Day for *Montpelier*.

An uncommon Palsy of the Eye-lids, by Dr. Andrew Cantwell, of Montpelier. N^o 449, p. 311, August, &c. 1738.

IV. The Intention in destroying the *Os unguis*, and *Saccus lacrymalis*, through which the Tears naturally distil into the Nose, is to procure

Some Thoughts on the Operation of the Fi-

fistula lacry-
malis by Fran-
cis-Joseph Hu-
nauld, M.D.
F.R.S. Reg.
Prof. Anat. &
Surg. and
Member of the
Roy. Acad. of
Sciences at Pa-
ris. N^o 437,
p. 54. April,
1735.

them a new Passage thither, by the Hole thus artificially made. Wherefore, in order to keep the Sides of this Hole asunder, to prevent it's filling up, and render the Flesh, which forms it's Circumference, hard and as it were callous, a Tent made of prepared Sponge, &c. is put into this new Passage, and is continued therein a Month or two. However, this Precaution, notwithstanding it happens but too often, that the Tears, instead of keeping the Road prepared for them with such Care, flow over the lower Eye lid, as before the Operation, and occasion a Weeping, which is now become past Remedy.

'Tis easy to prove, that those very Means, which are used after the Operation to make the Tears distil into the Nose, are generally the Cause of the subsequent Weeping: For by filling the Wound with small Pledgets, and putting a Tent into the Hole that was made, the Orifice of the little common Canal, that serves to convey the Tears into the *Ductus lacrymalis*, suffers a Compressure, and is rendered hard, thick, and callous, whereby, as it's Diameter is very small, it is easily stopped up. The Contusion made on this little Orifice, and round about it, brings on a Suppuration; after which the Parts coalesce, and the Orifice of this small Canal closes up. The Pus, or Sanies, that in the Course of the Distemper flowed back both through the common Canal, and the small Canals, which are a Continuation of the *Puncta lacrymalia*, has sometimes occasioned Excoriations; in consequence of which happens a Regeneration of Flesh during the Dressings, a small matter whereof is sufficient to stop up such slender Ducts. In fine, those small Canals, through which nothing passes for a Month or two, that the Dressings last, either close by their proper Springiness, or their Diameters are lessened by their small Vessels becoming varicous. 'Tis certain, that Injections are sometimes made through the *Puncta lacrymalia*; but the propelling Force of these Injections overcomes those Resistances, which the Cause that naturally drives the Tears into the *Puncta lacrymalia*, is not in a Condition to get the better of.

Thus it appears from the Detail of the Accidents I have enumerated, and which generally happen, more or less, that while the Artist is endeavouring to preserve a clear Passage for the Tears into the Nose, he labours, without designing it to stop the Entry of the upper Part of their Canal. I hope now to make appear, that the best way to avoid part of these Accidents, and keep open the new Canal from the Eye to the Nose, is precisely to do nothing. This is what Experience has confirmed me in, and what likewise Theory, well understood, will give us a clear Conception of.

'Tis a Thing not very easy to determine, how the Tears, and the Liquid that is continually found on the Surface of the Eye, in order to preserve the Cleanness and Transparency of the Cornea, can pass through the *Puncta lacrymalia*. 'Tis moreover observed, that when one lies in Bed, this Liquid enters into those *Puncta lacrymalia*, which in that Position are higher than the Eye, as well as into the *Puncta lacrymalia* of the opposite

posite Eye. The Ascent of Liquors in capillary Tubes above the Level, might be proposed to explain this last Fact. One might also in certain Circumstances imagine the Road which the Tears keep, to pass from the Eye into the Nose, to be a *Syphon*, the short Leg of which is divided into two. 'Tis strange that these two Ideas, which strike by their Simplicity, have not been offered by any one hitherto. It must be allowed, however, that they are not entirely sufficient to account for the *Phænoménon* under Consideration. The following *Rationale* seems to me quite as simple, and more accurate.

The Air present at the Orifices of all the Ducts, which have any communication with the *Trachæa*, is by it's proper Weight determined to enter them, when the Resistance happens to be diminished. Thus as, during Inspiration, it passes through the Mouth and Nostrils, so it likewise enters the *Puncta lacrymalia*; and must necessarily carry with it, towards the *Puncta lacrymalia*, and their small Canals, the Moisture that lubricates the Surface of the Ball of the Eye, as it mixes with it. Therefore it is easy to perceive already, that in order to preserve to the Tears their new and artificial Road into the Nose, one need only commit the whole Care to the continual Passage of the Air and Tears. 'Tis well known in good Surgery, that 'tis very difficult, not to say impossible, to effect a re-union in a Part, that serves as an *Emunctory* to a Liquor constantly flowing to it.

Now let us examine, if Nature alone can stop the Hole made by the Operation. It will not be imagined, that from the Remains of a bony *Lamina*, so thin as the *Os Unguis*, a sufficient Quantity of ossifying Juice can work out to stop it up. The *Periosteum* and *Saccus lacrymalis* are too much lacerated, to think it possible for them to repair of themselves what they had lost. Nor will it be believed, that the *Membrana pituitaria* can easily fill up the Hole made in it. Those are the Parts concerned in the Operation: But even if they are granted to be more disposed to a Re-production than they really are, still the Air and Tears will always be able to preserve themselves a Passage into the Nose.

Wherefore after having destroyed the *Saccus lacrymalis* and *Os Unguis*, instead of introducing an extraneous Body capable of making the Orifice of the small common Canal into the *Ductus lacrymalis* become callous, and of drawing on a Suppuration, the Communication between the Nose and Eye must be left entirely disengaged, and Liberty by this Means be given to Respiration to make both the Air alone, and the Air mixed with the Tears to pass continually through it.

In fine, the Action of these Fluids may be assisted by the Application of *Collyriums*, and by making frequent Injections into the *Puncta lacrymalia*; which, besides the common Effects that may be naturally expected from them, will contribute to prevent the Juice, that re-unites the Wound made in the Skin, from over streightening the Canal.

*A Description
of Needles made
for Operations
on the Eyes, by
Archibald Cle-
land, Surgeon,
N^o 461, p.
847, Aug. &c.
1741.*

* Fig. 74.

† Fig. 75.

V. The first * differs from a common Couching-needle in this, that it is made of two Pieces of Steel soldered together, and fixed in a Handle†: At a little Distance from the Handle they separate, and have, in each *Lamina*, a Button fixed, which passes through a Hole in the other; from this Part to the Points, they are so nicely applied, and polished together, that they cut, and have the Shape of a common Needle: Upon pressing the Buttons, the Points are separated, and in the Inside of the broad Part of the Points are several small Indents, to prevent any thing from slipping, after it has once got hold.

The Use of this Needle is, either to depress a Cataract; or, if it should be found of such a Nature as to bear to be taken hold of, then, by opening the Points, to engage it, and carefully bring it out of the Eye.

If it should happen, that in depressing the Cataract, or in bringing it out of the Eye, some of the small Vessels are wounded, and some Drops of Blood diffuse themselves in the aqueous Humour; this second Needle is made with Design to remedy this Inconveniency.

Fig. 76.

Fig. 77.

Fig. 78.

It is a long, small, round Stilet, gradually decreasing from the Handle to the Point; and is fitted to a long Silver Tube of the same Shape, into which the Needle is put, and the Point comes out at the End $\frac{1}{4}$ of an Inch. This is to be introduced into the Eye at the Orifice the other Needle had made: When it is so far introduced, as the End of the Tube is within the posterior Chamber of the aqueous Humour, the Needle is to be withdrawn, leaving the Tube in the Eye; and then, with the Mouth, may be sucked into the Tube, all the Blood, and watery Humour, that is contained there, or any other floating Particles: Then the Tube is to be withdrawn, and the Eye left to replenish itself with the aqueous Humour again; which will take Twelve or Eighteen Hours at most.

*Instruments
proposed to re-
medy some kinds
of Deafness
proceeding from
Obstructions in
the external
and internal
auditory Pas-
sages; by the
same. ibid. p.
848.*

* Fig. 79.

VI. In order to discover, with more Exactness, whether the Disorder lies in the outward Ear, I make use of a convex Glass, 3 Inches in Diameter, fixed in a Handle,* into which is lodged some Wax Candle, which comes out at a Hole near the Glass, and reaches to the Centre; which, when lighted, will dart the collected Rays of Light into the Bottom of the Ear, or to the Bottom of any Cavity that can be brought into a strait Line. Therefore, when it is discovered by the Help of this Glass, and lighted Candle, that the Ear is full of hard Wax, which will not bear to be taken out with the *Forceps*, the Method is to have a small Boiler, wherein are put some proper Herbs; and, by different Tubes of various Sizes, the Steam is conveyed to the Bottom of the Ear. In a short Time the Wax will dissolve, and the Person find great Ease. In one of these Tubes, are placed 2 Valves, to regulate the Heat to the Person's Inclination. If this has not the desired Effect, and the Person still remains deaf, the following Instruments are made to open the *Eustachian Tube*: If upon Trial, it should be found to be obstructed, the Passage is to be lubricated by throwing a little warm Water into it by a Syringe joined to a flexible silver Tube, which is introduced through the Nose into the oval Opening

Opening of the Duct at the posterior Opening of the *Nares*, towards the Arch of the Palate. The Pipes of the Syringe are made small, of Silver, to admit of bending them, as Occasion offers; and, for the most part, resemble small Catheters: They are mounted with a Sheep's Ureter; the other End of which is fixed to an Ivory Pipe; which is fitted to a Syringe, whereby warm Water may be injected: or they will admit to blow into the *Eustachian* Tube, and so force the Air into the Barrel of the Ear, and dilate the Tube sufficiently for the Discharge of the excrementitious Matter that may be lodged there. The Probes, which are of the same Shape with the Pipes, have small Notches near the Points, which take in some of the hardened and glutinous Matter, that is contained in those Tubes, which is distinguished by the fetid Smell, when the Probes are withdrawn. Fig. 80.

There is another Kind of Deafness, which proceeds from a violent Clap of Thunder, Noise of a Cannon, or the like. In this Case, it is probable, that the Position of the *Membrana Tympani* is altered, being forced inwards upon the small Bones, and so becomes concave outwardly. In this Case no Vibration of Sounds will be communicated to the Drum, until the Membrane has recovered it's natural Position. The Means, proposed to remedy this Disorder, are, first, (if the Person heard very well before; and it be not too long after the Accident has happened) to oblige the Patient to stop his Mouth and Nose, and force the Air through the *Eustachian* Tube into the Barrel of the Ear, by several strong Impulses; which will probably, push the Membrane back to it's natural State.

But if by any Accident, the Excrement is hardened in the Tube, or the Orifice of it, which opens into the Barrel of the Ear, should be stopped up, so as that no Air can be forced that Way, the second Method proposed, is to introduce into the *Meatus auditorius externus*, an Ivory Tube as near to the Drum as can be done, and so exactly fitted, that no Air can go in or out, betwixt the Skin of the external *Meatus* and the Tube. When it is thus fixed, I take the further small End in my Mouth, and, by degrees, draw out what Air is there contained; and I believe, it will act like a Sucker upon the Membrane, and draw it back to it's natural State; and then the Person will hear as before. If this should fail, I should be apt to believe the violent Shock this Membrane has suffered, may have dislocated some of the small Bones; in which Case there is scarcely any Remedy. And for the Diseases that are called *Nervous*, I must leave them to the learned Gentlemen of the Faculty. Fig. 82.

In this Ivory Tube may be fixed a Brass Cock, which, being turned, will hinder the rushing in of the Air, while the Person who sucks, takes Breath, and can renew his Suction. Fig. 83.

The flexible silver Tube, for injecting the *Eustachian* Tube, may be used without the Sheep's Ureter, by being screwed on to a small silver Syringe, as at *Fig. 84.* Fig. 84.

An Account of
Margaret Cutting, a young
Woman, now
living at
Wickham
Market, in
Suffolk, who
speaks readily
and intelligibly
though she has
lost her Tongue.
N^o 464, p.
143. Read
July 1, 1742.

VII. A brief Account of this young Woman's Case, in a Letter from Mr *Benj. Boddington*, of *Ipswich*, *Turkey Merchant*, to Mr *Henry Baker*, F. R. S. was communicated to the *Royal-Society* in Feb. last, and appeared so extraordinary, that Mr *Baker* was desired to make all possible Inquiries into the Reality of the Fact, and lay before the Society what Information he should receive in relation thereto.

In pursuance of this, he wrote to Mr *Boddington*, and begged the Favour of him to make the strictest and most critical Inquiry he was able into this Affair, not only by viewing the young Woman's Mouth, and examining her himself, but also by calling to his Assistance some skilful Gentleman in the Physical Way, and any other learned and judicious Person whom he might judge most likely to contribute towards discovering the real Truth, and detecting any Error, Fallacy, or Imposition. He likewise desired they would heedfully observe her Manner of speaking and articulating the Sounds of those Letters and Syllables, in the Formation whereof the *Apex* of the Tongue seems more particularly needful: And, in order to render their Examination more easy, as well as more satisfactory, he sent a List of Letters and Sounds, together with several such Sentences as he imagined would be most difficult to be pronounced without the Help of the Tongue.

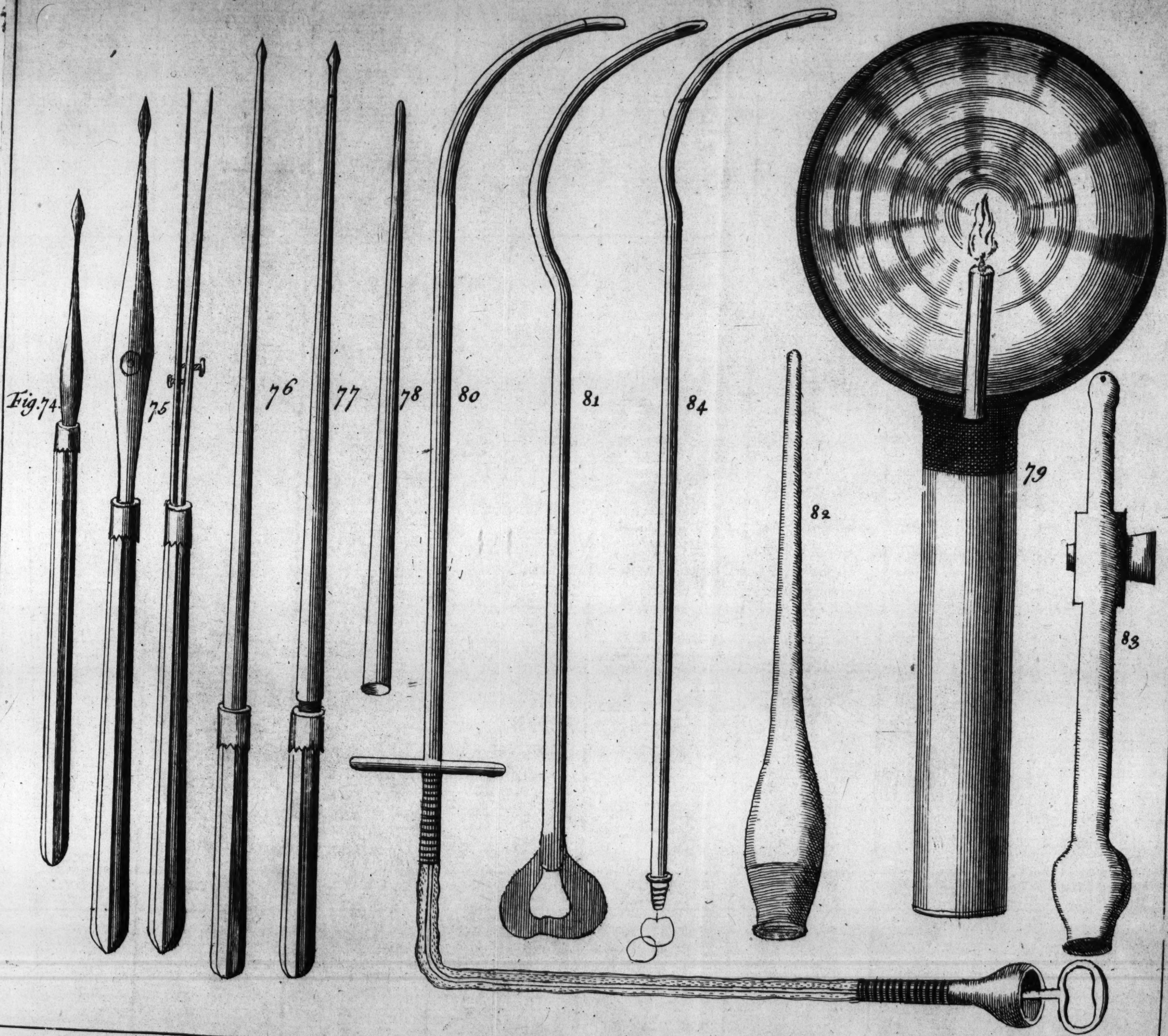
Mr *Boddington*, as soon after this as their Affairs would give them Leave, prevailed upon Mr *Nottcutt*, a Minister, a learned and curious Gentleman, and Mr *Hammond*, who perfectly understands Anatomy, to accompany him to *Wickham Market*, about 12 Miles from *Ipswich*, where the young Woman lives; whose Case (after they had inspected her Mouth, and examined her in the strictest Manner) is set forth in the following Certificate signed by them all.

Ipswich, April 9, 1742.

WE have this Day been at *Wickham Market*, to satisfy our Curiosity, concerning *Margeret Cutting*, a young Woman, who, we were informed, could talk and discourse without a Tongue.

She informed us, that she was now more than 20 Years of Age, born, at *Turnstal*, a Village within 4 Miles of *Wickham Market* in *Suffolk*, where she lost her Tongue by a Cancer (being then about 4 Years old). It first appeared like a small black Speck on the upper Superficies of the Tongue, and soon eat it's Way quite to the Root of it. She was under the Care of Mr *Scotchmore*, a Surgeon of *Saxmundham*, who soon pronounced the Case incurable. However he continued using the best Means he could for her Relief. One Day when he was syringing of it, the Tongue dropped out, and they received it into a Plate, the Girl, to their Amazement, saying to her Mother, 'Don't be frightened, Mamma; it will grow again.' It was near a Quarter of a Year after, before it was quite cured.

We proceeded to examine her Mouth with the greatest Exactness we could, but found not the least Appearance of any remaining Part of a Tongue, nor was there any *Uvula*. We observed a fleshy Excrecence



on the under Left Jaw, extending itself almost to the Place where the *Uvula* should be, about a Finger broad: This Excrescence, she said, did not begin to grow till some Years after the Cure: It is by no means moveable, but quite fixed to the Parts adjacent. The Passage down the Throat, at the Place where the *Uvula* should be, or a little to the Right of it, is a circular open Hole, large enough to admit a small Nutmeg.

Notwithstanding the Want of so necessary an Organ as the Tongue was generally supposed to be, to form a great Part of our Speech, and likewise to be assisting in Deglutition, to our great Admiration, she performed the Office of Deglutition, both in swallowing Solids and Fluids, as well as we could, and in the same Manner: And as to Speech she discoursed as fluently and well as other Persons do; though we observed a small Sound, like what is usually called speaking through the Nose; but, she said, she had then a great Cold, and she believed that occasioned it. She pronounced Letters and Syllables very articulately; the Vowels she pronounced perfectly, as also those Consonants, Syllables, and Words that seemed necessary to require the Help of the Tongue, as **d, l, t, n, r, at, al, ath, ash, cha, la, ta, ja.* The little Dog did not eat Bread.—Touch the Tooth.—Try to light the Candle—Thrice Thirty-three.—Let the large Cat scratch the little Dog.—The Church.—*doth.*—Lilly.— All these she pronounced perfectly. She read to us in a Book very distinctly and plain; only, we observed, that sometimes she pronounced Words ending in *ath* as *et*—ending as *emb*—ad as *eib*—; but it required a nice and strict Attention to observe even this Difference of Sound. She sings very prettily and pronounced her Words in singing as is common. What is still very wonderful, notwithstanding the Loss of this useful Organ, the Tongue, which is generally allowed by Anatomists, and Natural Philosophers, to be the chief, if not the sole Organ of Taste, she distinguishes all Tastes very nicely, and can tell the least perceivable Difference in either Smell or Taste.

We the underwritten do attest the above to be a true Account.

Benjamin Boddington.

William Notcutt, Minister.

William Hammond, Apothecary.

Mr Baker received along with the foregoing Certificate, by Letter from Mr Boddington, some farther Particulars, which he supposed less material. He says, in her Person she is a little thin Body, genteel enough, a pretty good Face, fair Complexion, with light brown Hair, of a weakly Constitution, lame on one Side, through Weakness after a Fever and the Small-Pox, which she had last Summer. She seems a well behaved Girl, and has nothing of a Country Mien. She discourses agreeably, very fluently and pertinently, has every thing clean and neat about her, gets her Livelihood by making Mantuas, and has an Aunt in London, named *Mary Cutting*, who is House-keeper to the Dowager Lady Rockford in Bond-street.

* These were the Letters, Sounds, and Sentences mentioned by Mr Baker.

Of a young Woman who speaks intelligibly without a Tongue.

He says, if she were among 20 People in a Room, he thinks it would be impossible for a Stranger by any means to guess her being the Person without a Tongue, for she has no odd Motion of her Mouth or Lips in speaking: She sings with an easy Air, and modulates her Voice prettily. He asked her, if she did not miss her Tongue, or find any Inconvenience from the Want of it? She answered, No: Not in the least; nor could she imagine what Advantage he had in the Use of his. He inquired, how she did to guide her Food in her Mouth to eat: She replied, very easily, she could eat before, on one Side, or the other, as she pleased, but could not explain the Manner how. He was very observing to see her eat, but could discern no Difference from others in the moving of her Jaws, or other Motions of her Face, nor in her swallowing Food, or in drinking; she did both very neatly, and had exactly the same Motion in her Throat as we have in it's passing down.

He was apprehensive the Excrescence mentioned in the Certificate, might, in some measure, supply the Use of a Tongue; but she assured him, it never moved in the least, and that she spoke as well before it began to grow (which was several Years after the Cure); and Mr *Hammond* convinced him, by trying with their Fingers and a Spoon, that it was quite fixed and immoveable. He observes further, that she is no ways assisted by a good Set of Teeth; for she has but few, those bad, and scarce so high as her Gums. He asked her, in what Part of her Mouth her most sensible Taste lay? She said, it was all over alike; and, smiling, added, she was afraid she was too nice in that; for, if her Butter was not curious, she eat dry Bread.

Mr *Boddington*, in another Letter to Mr *James Theobald*, F. R. S. dated *April 14, 1742*, after giving an Account of this young Woman in the Manner as before, adds, he can recollect nothing more, except her telling him, that though she was able to speak from the very first losing of her Tongue, she was not so happy as to her Deglutition; for she was unable to swallow any thing solid for many Months after, without it's being minced very fine, and then thrust into her Throat by a Finger: But by Degrees, she knows not how, she became able to manage without that Help, and could eat any thing in the same Manner as other Persons can. He adds, that, in his own Mind, he thinks the fleshy Excrescence is of great Service to her, though she cannot make out in what manner: That for his own Part, he had formerly supposed it as impossible to speak without a Tongue, as to see without Eyes; and therefore expects many who shall hear this Account, will continue Unbelievers, and think he and his Friends are all mistaken, that they do not know what they see, and that their Ignorance is the only Ground of their Admiration.

While Mr *Baker* was making his Inquiries, he was informed, that Mr *John Dennis*, Tobacconist, in *Aldersgate-street*, could give him a full and satisfactory Account of this Affair: He therefore applied to Mr *Dennis*,

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Mr *Dennis*, who assured him in a very civil, candid, and intelligent Manner, that he was well acquainted with *Margaret Cutting*, having many Years ago been carried by a Gentleman to see her as a Prodigy, for being able to speak without a Tongue: That he had seen her several times since, commonly calling on her when he travels that Way, and carrying some Friend or other with him; and at all these times he had inspected her Mouth, and was sure she had no Tongue: And that last Summer, in particular, he and another went to see her: That he would declare this under his Hand, and should always be ready to attest the Truth of it to any Body, or in any Manner. He likewise gave an Account how she lost her Tongue, as he had it from her Mother, who died some Years ago, and it was exactly as above related; and said he had been told the same by an Apothecary also, who had her in Hand along with Dr *Scotchmore*.

The Testimony of Mr *Dennis*, and the Person who saw her with him last Summer, is as follows:

March 20, 1741.

WE the under-written saw *Margaret Cutting*, at *Wickham Market* in *Suffolk*, in or about *June* last; and, examining her Mouth, found she had no Tongue, and yet she speaks very intelligibly.

John Dennis.

Gabriel Daniells.

MYself saw her in about 2 or 3 Years after her Tongue was lost, had a full Account of it from her Mother, heard her then speak, and have seen and heard her divers times since, and heard her talk better and better.

She was under the Care of Dr *Scotchmore* at *Saxmundham, Suffolk*.

John Dennis.

Mr *Dennis* (upon Mr *Baker's* Inquiry) wrote to the young Woman herself, acquainting her, that many People would not believe it possible for her to speak without a Tongue, and desiring she would not be ashamed to give an Account of herself under her own Hand; in Answer to which he received the following Letter:

To Mr *John Dennis*, in *Aldersgate-Street*.

Sir,

THIS being the first Opportunity that I had to answer your Letter, I assure you, that I have no more Tongue in my Mouth than I had when you saw me last, which is none; but Thanks be to my God, I have had the Happiness to speak ever since it came out, which was when I was about 4 Years old. As for my Age now, I cannot rightly tell, but I think I am about 24 Years old. I would have none suspect the Truth of it; for I have no Tongue, and can

speaking very well, and this is from my own Hand. I was not ashamed to write about myself, but of my bad Writing. So no more, but I am

Your humble Servant,

Margaret Cutting.

The Case of this young Woman is indeed extraordinary *; but there are several Examples of like Nature to be met with in medical Writers, and those of the greatest Authority; one of which, as it has the Attestation of a whole University, cannot be improper to mention here: Monsieur *Drelincourt*, a very noted Physician, tells us, in his Treatise on the Small-Pox, of a Child 8 Years of Age, who had lost his Tongue by that Distemper, and was yet able to speak, to the Astonishment of the University of *Saumur* in *France*; and that the University (who doubtless had first carefully examined into the Truth) had attested it, by drawing up a particular Account of the Fact, that Posterity might have no Room to doubt concerning the Validity of it. The Account is to be met with at large, in the third Volume of the *Ephemerides Germanicae*, under the Title of *Aglossostomographia*.

Tulpius too makes mention of a Man who had the Misfortune to have his Tongue cut out by the *Turks*, and yet, after 3 Years, could speak very distinctly. He says, he went himself to *Wesop*, a Town in *Holland*, to be satisfied of the Truth of it, and found it to be as it was reported. Nay, he does not so much as mention any Defect in his Speech, but assures us, that he could pronounce those Letters which depend upon the *Apex* of the Tongue, even the Consonants, very articulately. And this Case is still the more worthy Attention, because the Patient could not swallow even the least Quantity of Food, unless he thrust it into the *Oesophagus* by means of his Finger.

If we go back to earlier Times, the Emperor *Justin*. in *Cod. Tit. de Off. Praef. Praet. Af.* says, he had seen venerable Men, *qui abscissis radicitus Linguis, panas miserabiliter loquebantur*, whose Tongues having been cut out by the Roots, they miserably spoke, or complained, of the Punishments they had suffered. And again, *Nonnullos alios, quibus Honorichius Vandalorum Rex Linguas radicitus praeciderat, loquebam tamen habuisse integram*, that some others, whose Tongues *Honorichius*, King of the *Vandals*, had cut out by the Roots, yet perfectly retained their Speech.

An Account of the Wound, which the late Lord Carpenter received at Brihuega; whereby a Bullet remained near his Gullet for a

VIII. Lord Carpenter was wounded at the Defence of the Breach of *Brihuega* in *Spain*, in the Mouth by a small *Spanish* Musket-ball, which having taken away Part of his upper Lip, beat out all his Teeth (except two) on one Side, broke and splintered part of his upper Jaw-bone, went through his Tongue, and lodged itself near his Gullet, where it remained 51 Weeks and 3 Days before it was extracted, the Surgeons thinking it had been spit out with some of his Teeth soon after his

* *N. B.* All the original Papers are in the Repository of the *Royal Society*.

being

being wounded. The Ledge which was made upon the Bullet by the two Fore Teeth, lying almost by the Gullet, and continually grating upon it, occasioned an intolerable Pain *, and preventing him from swallowing any thing but Liquids, it brought him so low, that his Life being despaired of, to make a final Trial, his Tongue was drawn out as far as it could be, and one of the Surgeons feeling the Ball with his Probe, which he then took to be a Piece of a Tooth, (several Pieces of Teeth having been beat into his Tongue by the Bullet) and endeavouring to extract it, he took hold of the Ledge with his Forceps, and pulled the Ball out, after which he recovered in a few Weeks.

The Marks of the Fore Teeth are to be seen on the Bullet, and where it flatted upon the Jaw-bone.

* See Vol. V. Chap. iii. §. 5.

Year wanting
a few Days;
communicated
to the R. S. by
his Son the R.
Hon. George
Ld Carpenter,
F. R. S. &c.

CHAP. IV.

The NECK and THORAX.

I. I Have drawn this rough Sketch by Memory, not having any of the Doctor's Papers by me, except some Drawings which are engraved with some Improvements, in Fig. 85, 86, 87, 88.

A short Ac-
count of Dr.
Alexander
Stuart's Paper
concerning the
Muscular
Structure of
the Heart:
Read at several
Meetings of
the Royal Soc.
in May and
June 1735. by
C. Mortimer,
M. D. R. S.
Sec. No.
460. p. 675.
* Fig. 85.

I shall not here undertake to give a Description of all the Parts belonging to the Heart, supposing them already sufficiently known from the anatomical Writers; but shall only explain the surprizing Simplicity of the Muscular Structure of the Heart, as Dr Stuart hath demonstrated it from various Preparations of boiled Hearts, viz. that the Heart is nothing else than a single Muscle of nearly a semicircular Form, whose Fibres are all parallel: For, suppose a rectangular Parallelogram, $ABCD^*$, consisting of 2 Squares $ABEF$, and $EFC D$; in each of which draw first the Diagonals EB and CF ; then fill the whole Parallelogram, or both Squares, with Lines at equal Distances, and parallel to the Diagonals: This done, at the Center F , with the Radius FB , draw the Semicircle BED , and do the same on the Backside of the Paper; so that every Line on the Backside may lie exactly under each corresponding Line on the Foreside, and that each Side may be as exactly alike, as if the Paper were transparent, and that the Lines might be seen equally plain on either Side: Cut this Semicircle out of the Parallelogram, and cut out likewise a small semicircular Piece at the Center F ; then roll up this semicircular Piece of Paper in a conical Manner, so that the Backside of D (or to I , in Fig. 86.) be folded to the Back of E (or to H in Fig. 86.) and this Fold turned round, till E comes to the Backside of B , as in Fig. 87. and the Seam formed by the Edges BF and EF may be pasted together, only the inner Fold on the Right Side must be pushed back from the outer circular one, so as to form a Partition, as at G , in Fig. 88. and 87. by which

Fig. 86.

Fig. 87.

Fig. 88.

means two Cavities will be formed, that on the Right Side the Partition in this Form , the other, on the Left Side, almost circular, thus, , as in Fig. 88. the Outside of the first consisting but of one single Fold, the Outside of the latter consisting of a double Fold, and the Partition being but of one Fold: Thus the first Cavity represents the Right Ventricle of the Heart, the other the Left Ventricle, and the Partition *G* the *Septum*, as in Fig. 88. All these Particulars are distinctly expressed in Fig. 86. which is to be cut off from Fig. 85, 87, and 88, and is to be folded upon the Line *BD*, so that the Letters *EE* and *HH* come exactly Back to Back, and that the Line *EF* and *HF* tally precisely; paste this Paper thus folded together Back to Back, then cut off the white Paper to the Rim of the Circle, and cut out a Piece at the Center to *F*, and you will by this means have a semicircular Piece of Paper, with all the Lines represented on both Sides tallying to each other, as above described at Fig. 85. But as it was very difficult to print on each Side of the same Paper, so as to make the Lines tally, I thought it better to have this Figure printed in a whole Circle, that so such as would be at the Pains, might cut it off, paste it, and fold it, and thus, as it were, form a Model of an Heart. In this Figure likewise I ordered the Engraver to distinguish the several Surfaces of the muscular Coats, by Lines and Dots, in such manner as Colours are represented in Heraldry graving: Thus the Outside of the Right Ventricle is shaded with Lines running from Top to Bottom pretty close, which denote that you should paint that of a dark Red; the Outside of the Left Ventricle, with Lines in the same Direction, but farther asunder, to denote a lighter Red; the Inside of the Right Ventricle is shaded with Lines from Right to Left, to denote it should be coloured (for Distinction Sake) blue; then, where the double Course of Fibres form the outward Side, or Left Side of the Left Ventricle, and which are not to be separated but by Art, there the Paper is left white or blank; but the Inside of the Cavity of the Left Ventricle is dotted, to represent yellow, that it may be coloured so: The colouring the Figure in this Manner, makes all the Parts much more distinct, when rolled up into a Cone.

This Model, if I may so call it, compared with the Heart of Man or Quadruped, will be found to answer in the following Manner: The Edge *BF*, in Fig. 85. or *EF* in Fig. 86. answers to the tendinous Seam or *Sulcus*, which runs along the superior Side of the Heart; and the Direction of the parallel Lines in Fig. 85 and 86. answers to the Course of the Fibres in each Part of the Heart; the circular Edge of the Paper *BED* answering to the tendinous Circle round the Base of the Heart, from which, and the Seam *BF*, all the muscular Fibres take their Original: The exterior Fibres of the Right Ventricle, next the *Apex* or Point of the Heart at *F*, decussate * each other, run in-

* This may be imitated by gumming on Threads, in the same Directions as the parallel Lines in Fig. 85. turning them back cross the Hole left at *F*.

wards, and then, rising up again towards the Base, form that Side of the *Septum* which constitutes Part of the Inside of the Right Ventricle; and likewise form the *Columnæ carneæ* of the Right Ventricle: The Fibres of the interior Course of the Left Ventricle decussate and form in the same manner the internal Fibres and *Columnæ carneæ* of the same Ventricle: The external Course of Fibres of the Left Ventricle are only a Continuation of those of the Right Ventricle, which together embrace the Heart circularly, while the internal Course of Fibres of the Left Ventricle run chiefly from the *Apex* towards the Base, so that on the Left Side of the Ventricle they cross the external Course nearly at Right Angles; but on the Side of that Ventricle which forms the *Septum*, they run from the *Apex* towards the Base, in the same Direction as on that Side of the *Septum* which is next to the Right Ventricle.

The several Courses of the Fibres may be easily traced in a boiled Heart; and if they are not found to answer to the Directions of the Lines on the Paper-Cone with the strictest mathematical Exactness, when rolled up as at *Fig. 87.* you must consider, that the Form of the Heart is not exactly conic, though nearest reducible to that Figure; and moreover that the Base is not a Plane as in the Paper-Cone, but of a convex round Form; and the tendinous Circle round it is of a smaller Diameter than the Middle Part of the Heart.

By this Structure and Circumvolution of the Fibres, the Muscle which constitutes the Heart, doth, by a simple Contraction of it's Length, by those external Fibres, which encompass both Ventricles, contract the Diameter of the Heart, while by the internal Fibres, that form the *Septum* and Inside of the Left Ventricle, it shortens the Length of the Heart, or draws the *Apex* up nearer to the Base: This is done without any Contrariety in the Action of these Fibres, or destroying the Force of each other; but, on the contrary, they being all parallel to each other; and a Continuation of the same Fibres, do assist each other in their Action.

The Doctor supposes this Contraction is not caused so much by the Influx of the nervous Spirits, as by the Influx of the arterial Blood, through the Coronary Arteries into the Substance of the Heart; and that the Contraction of the Auricles comes from the same Cause; which will be alternate with that of the Heart, because the lateral Branches, which arise out of the Trunk of the Coronary Artery, that encompasses the Base of the Heart and both Auricles, are on one Side distributed into the Substance of the Heart, and on the other Side into the Coat of the Auricles; and will be alternately compressed, and alternately free, as the Auricles and Ventricles are alternately full or empty of Blood.

II. 1. Mr — dying at the Age of Twenty-two, of an Illness that had perplexed his Physicians, was opened, to discover an Imposthume, which was apprehended in the Belly. As nothing was observed there

An Extraordinary Case of the Foramen Ovale of the

worth

Heart, being found open in an Adult; communicated by Claudius Amyand, Esq; Serjeant Surgeon to his Majesty, and F. R. S. No. 439. p. 172. O&C. &c. 1735.

Concerning the Foramen Ovale being found open in the Hearts of Adults, by M. le Cat, M. D. F. R. S. Surgeon to the Hôtel Dieu at Rouën. Translated from the French by T. S. M. D. F. R. S. No. 460. p. 681. Apr. &c. 1741.

EXPLANATION of the Figures.
Fig. 89, 90.

Fig. 91.

Fig. 92.

Fig. 93.

worth Notice, saving a very great Relaxation of the *Viscera*, the Cause of his Death was looked for in the *Thorax*; there the Lungs were strongly attached to the *Pleura* on each Side, and a large Collection of Water in each Cavity, especially on the Left, where the posterior Lobe was inflamed, and tending to Suppuration; the Quantity of Water in the *Pericardium* was greater than usual, and the Heart much larger than could be expected in so great an Atrophy as the Patient was reduced to; in it the *Foramen Ovale* was found open, so as to give Passage to a large Finger, when a fungous Substance, which grew from the Circumference of the *Foramen*, and did stop up the same, was removed. The Valve was hardly perceptible, it being callous and furled up. The *Ductus Arteriosus* was found close as usual. This Patient had enjoyed great Health till lately, and had given no Sign of this Opening of the *Foramen Ovale*, which is præternatural in Adults.

2. This last Winter I opened a great Number of dead Bodies of Men grown; and did not find the *Foramen Ovale* open in any of them. The oldest of the Male Subjects, in which I found it open, was a Lad of 15 Years of Age. Of 20 Bodies of Women, which I examined, in seven I found the *Foramen Ovale* open.

Among the Number of Openings that remain of this *Foramen*, there is a great Variety in their Shape, and in that of the *Cicatrices* or Adherences of the *Valve*: However, they may conveniently be reduced to 3 Sorts, expressed in the Figures.

Fig. 89. The *Foramen Ovale* viewed on the Side of the Right Auricle. A. A Valve that throws itself on the Side of the Left Auricle, and appears closed up chiefly by a Continuation of the Membrane that lines this Auricle. B. The Place where this Valve leaves a Hole, which opens into the Left Auricle. C. The Part contiguous to the Right Ventricle.

Fig. 90. The same *Foramen Ovale* viewed on the Side of the Left Auricle. A. The Valve drawn a little back, that the Hole may be seen. B. The Point to which the Valve ascended, when left at Liberty. C. The Part which leads to the Left Ventricle.

Fig 91. The second Sort of *Foramen Ovale* open in the Adult, and seen on the Side of the Right Auricle. It differs from the first Sort, in being more sunk in, or more approaching the Shape of a Funnel.

Fig. 92. The same *Foramen Ovale* of the second Sort, seen on the Side of the Left Auricle. It differs from the same Side of that of the first Sort, by the Valve beginning to make the Goosefoot by it's different Attaches, which much resemble the Columns of the mitral Valves of the Heart. In the Figure I have added a Probe passed into the *Foramen Ovale* from the Right Auricle to the Left.

Fig. 93. The *Foramen Ovale* of the third Sort open in the Adult, viewed on the Side of the Right Auricle. This Sort differs from the preceding two, by the *Foramen Ovale* nearly forming a Funnel.

Fig. 94.

Fig. 94. The same Foramen Ovale viewed on the Side of the Left Auricle, and two Probes passed into it's Aperture. This Sort differs from the preceding ones, by the Goose-foot formed by the Valve being much more compounded. The Circle of Points A. marks the Place which answers the oval Cavity that is in the Right Auricle, and is the Cicatrix of the Foramen Ovale at the Birth. The Women in whom I have found the Foramen Ovale of the second and third Sort, were about 60 Years of Age.

III. I have observed, in a new-born Female Infant, the Heart without a Pericardium, and turned upside down, so that it's Basis, with all the Vessels, had fallen down as low as the Navel; and it's Apex, still on the Left Side, lay hid between the 2. Lungs. How could the Circulation be carried on, the Heart being thus inverted? and yet the Child lived several Days after Birth. I observed the Heart from it's Basis, whence the Aorta and pulmonary Artery spring, and where the Cava and pulmonary Vein enter it, to it's Cone, surrounded loosely with several Windings of these Vessels, through which the Blood's Circulation must necessarily be performed.

Of the Heart of a Child turned upside down; by Jos. Ignat. de Torres, M. D. No. 461, p. 776. dated Gandia in Valencia, Mar. 19. 1738, N. S.

IV. During the exceeding dry, cold Weather, in Feb. and March last, several of the Men brought Home in the *Deptford* and *Dunkirk* Men of War, from the *West-Indies*, were seized with short, importunate, asthmatic Coughs, without any Expectoration. Violent and almost continual Palpitation of the Heart, with a perpetual intermitting, trembling, fluttering Pulse, and a constant Anxiety, Pain, and Sinking of the Heart, as they expressed it. They breathed with excessive Difficulty, and could scarce lie down in Bed without Suffocation. Their Heads, as it were, sunk between their Shoulders, and they had very dead, heavy, Countenances. Some had Pains of the Side, though very little apparent Fever. Upwards of 20 Persons were in a very short Time carried off towards the End of March in this Manner, notwithstanding the most proper and diligent Care, by Bleeding, Vomiting, Blistering, Attenuants, Di-

Concerning Polypi taken out of the Hearts of several Sailors just arrived at Plymouth from the West-Indies, by John Huxham, M. D. No. 464, p. 123. read May 20. 1742.

Upon this, Mr *Wyatt*, First Surgeon of the Hospital, ordered 2 of the Dead to be opened forthwith; they were about 40 Years old. He found monstrous Polypi in both their Hearts, and directly had the Hearts carried to his own House, and soon acquainted me with the whole Matter: We very carefully examined them. The Polypi were very nearly of the Colour of the Buff formed on the Surface of highly pleuritic or rheumatic Blood, when quite cold, or rather whiter. They were vastly tough, and seemed to be formed of various Lamine very closely connected, though here and there a bloody Vein, as it were, was interspersed. They were not only firmly attached to the fleshy Columnæ of the Heart, but were also sunk and inserted strongly into the Intercolumnia, or Sulci, and that even to the very Bottom of the Ventricles. These Roots, if we may so call them, were of a whiter Colour than the Body of the Polypus.

Of Polypi taken out of the Hearts of several Sailors.

One of these *Polypi* (taken out of the Heart of *Jeremy Mannings*) weighed a full Ounce, not including it's Ramifications in the *Arteria Pulmonaris* and the *Cava*, but as it was taken out of the Right Auricle and Ventricle; for it was one continued Mass, and strongly adhered to both.

The *Polypus* taken out of the Left Ventricle of the same Heart, was also very considerable, and rather more firm and compact than that of the Right, but of the very same Colour, and firmly implanted into the Sides of the Ventricle quite down to the *Mucro Cordis*. It's Branches were shot a great Way into the Subclavian and Carotid Arteries. But very little down the *Aorta*. I observed one of the semilunar Valves of the *Aorta* beginning to grow bony.

There were likewise found very great *Polypi* in the Right and Left Cavities of the other Heart, of the same Colour, Firmness, and Tenacity, but not altogether so large; and they respectively branched their *Appendices* a great Way into the Pulmonary Artery, *Aorta*, &c.

More of the Sailors dying in the very same way soon after, the *Thorax* of another was opened, that of a young Man about 20. In the Right Auricle and Ventricle of his Heart was found a large tough subrubicund *Polypus*, not quite so white as those mentioned before. But there was no such Concretion in the Left.

Now though *Kerkringius* and others have endeavoured to explode the Notion of the Formation of true *Polypi* in the Heart and Blood-Vessels; yet *Malpighius*, *Bartholine*, *Tulpius*, *Pecclin*, and others, have given us incontestable Instances of the Existence of true *Polypi* in the Heart in the strictest Sense; and you have here 3 unquestionable Evidences of the like Nature: Such, indeed, especially the 2 former, as I have never before met with amidst the very numerous Dissections I have been first and last present at.

Before I conclude this it may not be amiss to mention, that I had the first Lieutenant and Purser of the *Dunkirk* under my Care in very severe *Pleuroperipneumonies*, whose Blood was as viscid as I ever saw; and they were with very great Difficulty saved, nor could they be brought to expectorate till the Seventh Day of the Fever.

It may be observed also, that the above Ships came Home from a very hot Climate into a very cold one, in the midst of Winter, and that a long continued Course of North-easterly Winds kept on, and even increased the Cold to a great Degree. That *Pleurisies*, *Peripneumonies*, &c. are commonly the Effects of such a Constitution of Air. That the Blood of such as labour under these Disorders is always extremely sily; and that the Heat of the Weather in the *West-Indies*, and large and long continued Use of spirituous Liquors, had greatly condensed the Blood of these poor Fellows, and that in the Blood-Vessels of the *Thorax* of such as die of these Distempers, *polypose* Concretions are not uncommonly found.

V. Thomas

V. *Thomas Halfey*, aged about 70, of a short make, and pretty fat, being in a tolerably good State of Health, (unless, as for some Years past, troubled with frequent coughing upon Motion) was seized Sept. 23, 1740. with a violent Fit of Coughing, in which he fell down, as the By-standers thought, dead, and discharged near a Quart of Blood at his Mouth, in a very large Stream, mixed with many Portions of a seemingly grumous Matter. His coughing Fit continued near 3 Minutes. He revived upon bleeding at the Arm, and, being put to-bed, recovered his Senses, and (as he said) was perfectly easy, and free from Pain, except upon Coughing, which as often as he did, he spit Blood visibly arterial from it's florid Colour. About Four Hours after the First Fit, he was taken with a Second, attended with the same Symptoms as the First; and expired in it. Upon examining the Blood, which he brought up at his Death, I found, in Pieces of different Sizes, near Three Ounces of the Substance of the Lungs, not ulcerated, or any ways distempered; and I have Reason to believe there was near the same Quantity of the Lungs thrown up during the first Fit of Coughing. The Pieces were easily distinguishable from grumous Blood, by their connecting Membrane, the *Acini* in the internal Part, and their specific Gravity.

Upon examining the Contents of the *Thorax* after Death, the Right Lobes of the Lungs were found, of a good Colour, and no ways injured: In the Left Cavity of the *Thorax*, there was a large Quantity of extravasated Blood; the inferior Left Lobe adhered strongly both to the *Pleura* and *Mediastinum*, and was somewhat decayed; but of the superior Left Lobe, the upper Part next the *Trachea* adhered to the *Pleura* for about 2 Inches; and the Remainder, where there had been no Adhesion, (as I could perceive from the smooth Surface of the *Pleura*) was torn away by Pieces, and discharged in Coughing. As the greatest Part of the Left Side of the Lungs was tied down to the circumjacent *Membranes*, the Person being old, and the whole Force of the *Parietes* of the *Abdomen*, *Diaphragm*, &c. in the Action of coughing, was unequally exerted upon that Part that did not adhere, and which, by the Violence of the Pressure, was torn off from the rest, and discharged as I just now mentioned; it is worthy Observation, how small the Degree of Sensibility is in the Lungs; that a Person should lose so much of their Substance, as in this Instance, upon the First Fit; and yet, upon Recovery of his Senses, to complain of little or no Pain from such Dilaceration, when even the Bite of an Insect upon the Surface of the Body is attended with so much.

The Adhesion of this Man's Lungs explained likewise the Cause of his frequent Coughing for some Years before his Death.

A Case wherein Part of the Lungs were coughed up, by Will. Watson, F. R. S. No. 459, p. 623, Jan. 1741.

Experiments
on the Perfora-
tion of the Tho-
rax, and it's
Effects in Re-
spiration, made
at Leyden, in
1728, and
1729, by the
late W. Hous-
toun, M. D.
F. R. S. No.
441. p. 230,
Apr. &c.
1736.
Exp. I.

VI. In *April* 1728, I made a Puncture into the Thorax of a little Dog, on each Side, with a small Penknife. After this Operation, the Dog barked and howled as strongly as he had done before, and shewed no Sign of an injured Respiration. Hence some of the Standers-by suspected that I had not penetrated quite into the cavity, wherefore, to remove all Doubt, I made another Pair of Wounds, but with the same Success, for the Dog remained unhurt, either in Life or Voice, from 9 in the Morning till 6 in the Afternoon, when I killed him, to see what was done.

Upon opening the Thorax the 4 Punctures appeared very evidently to have penetrated into the Cavity: And upon blowing up the Lungs, there was not found any Defect in them, tho' the Knife had entered almost a Finger's Breadth into their Cavities, nor did the Air get out any more than it uses to do from the soundest Lungs.

Exp. II.

In *August* following, I tried the same Experiment upon 2 Puppies, about 4 Days old, opening one Side of the Thorax with Punctures only, the other with broad Wounds, so as to discover the Lungs on each Side, which did not however subside, but rather seem to thrust themselves outwards. They continued crying, 'till, in about a quarter of an hour, I took pity on them, and put an end to their Life and Misery.

Exp. III.

About the Beginning of *November* I made a large Wound on each Side of the Thorax of a middle sized Dog. I thrust my Finger through the Apertures into each Cavity of the Thorax, and perceived the Lungs to be so far collapsed, that there was about a Thumb's Breadth between them and the Membrane which lines the Ribs; two other Students of Physick thrust in their Fingers also, and felt the same. But as soon as the Dog was loosened, he got up very briskly, ran about the Room, and howled upon being hurt. No Application was made to the Wound till the next Day, when I applied some Pledgets dipped in Turpentine. The Dog being kept for 3 Days was so far from losing his Voice, that he was very troublesome with his Noise, and at last being let loose, ran quite away.

Exp. IV.

Jan. 14, 1729. Having procured a young Dog, I had a mind to open his Thorax and let in the Air, without any great Wound of the Skin and Muscles; that I might neither cause a troublesome Hæmorrhagy, nor give the Animal unnecessary Pain. Therefore making a Hole with a Trochart, I introduced a Goose-quill into the Cavity, upon which I put a Cap of Leather, covered with Pitch, to stick to the shorn Skin, and so keep in the Quill: But the moveable Skin soon drew the Quill out of the Cavity of the Thorax, and I found it sticking upon the Ribs. But being in hopes, that I might be able to keep it in, I made a new Puncture, and thrust it in a second Time, and tried it as often on the other Side, but without Success. This Hope being frustrated, I separated the Skin on both Sides with a long Incision, and then divided the intercostal Muscles, and penetrated into each Cavity

Cavity of the Thorax, which was manifest by the violent Eruption of the Air. The next Day, I put Tents of Cork into the Wounds, which, being thicker at each End than in the middle, wanted neither Bandages nor Plaisters to keep them in. The Dog, with all these Operations, neither died, nor lost his voice; but eat, drank, and seemed well enough, only he could hardly lie on his side, because of the Wounds and especially the Tents. The Air was now and then let in by taking out the Tents; nay, it was blown through a Pipe into one Side. After he had lived, in this Manner, two Days, without any sensible Injury to his Voice: On the third Day, as I was handling him, both Tents burst out, on a sudden, with some Force, and the Air passing in and out through the Wounds, made such a hissing, that being affrighted partly by the Noise, and partly by the Apprehension of my hurting him again, he ran away, and hid himself under the Bed. I thrust the Tents again into his Wounds, but they soon flew out again. In this Condition he lived from 10 in the Morning till about 5 in the Evening, and was seen, not without Wonder, by several Students. At last I mentioned it to Dr *Van Swieten*, who being as much surprized as the rest, persuaded me to kill the Dog, and open him. But being willing to observe the further Consequence of his Wounds, I deferred killing him 'till the next Day. Thus he lived 4 whole Days after the Opening of his Breast, and at last was hanged, and shewed no Sign of an injured Respiration before the end of the third Day, when he began to wheeze a little.

The Thorax, when opened after Death, contained a good deal of sanious Matter on each Side. The Lungs were contracted into a small Space; one Side, as far as we could perceive, being sound, the other wounded.

Dr *Van Swieten*, being willing to enquire further into the Affair, made some Experiments himself. I had not leisure to attend the First, but the Second, which I saw, was as follows.

Jan. 25, 1729. A middle sized Dog was tied to a Board, and his Exp. V. Thorax was opened, on both Sides, with a large Wound. His Voice did not fail; and the Lungs were so far from collapsing, that a Lobule of them, thrust itself through each of the Apertures. These Lobules being on the outside did not cease to be contracted and dilated; and what was most wonderful, they were dilated when the Thorax was contracted, and on the contrary. Air being blown into the Cavities of the Breast, did no Injury to the Respiration of the Animal. After it had lived in this Manner, for $\frac{1}{2}$ an Hour, without any sensible Injury of the Voice, or of Respiration, the Wound on one Side of the Thorax was enlarged, by cutting through the Rib: Now appeared a great Paradox, the Lungs were contracted, whilst the Breast was dilated; and dilated whilst it was contracted. The Dog survived this Operation also, and after every Body had been satisfied, was hanged.

The unexpected Phænomena of these Experiments, were the Cause of my making the following, with some Fellow-Students, in order to examine whether the Lungs were always applied to the Membrane of the Pleura, when the Thorax was entire.

Exp. VI.

We bound a little Dog firmly to a Plank, with his Limbs extended. We raised Part of the Skin, and cut it off with a Pair of Scissars, in that Part of the Thorax, where the Ribs are not covered by the incumbent Muscles. When we had wiped away the Blood, and staunch'd it with Spirit of Wine, we cut off all that covered the Ribs, and intercostal Muscles; and at last carefully separated the intercostal Muscles. The Pleura being thus laid bare, afforded the following Phænomena, whilst the Breast was dilated, there appeared, something white, on the inside, applied to the Pleura, and whilst the Breast was contracted, and the Animal expired, that white Body gave place to something red, that came up in it's room; when the Breast was dilated again, the red Body went down, and the white came up, and so on alternately. We then took off the Muscles from the upper Interstice of the Ribs; but there nothing but white appeared. The Pleura, in both Parts, became concave, when the Breast was dilated; and a little (but scarce sensibly) convex, when it was contracted.

When we had satisfied ourselves with this, we opened the Breast by cutting two of the Ribs, with a Wound large enough to shew all the Contents of that Side; when this was done, the Animal ceased howling, tho' his Thorax was untouched on the other Side. That Side of the Lungs was immediately collaps'd, but did not quite lose the alternate Motion of Dilatation and Contraction; and all that were present agreed, that it's Dilatation, and the Contraction of the Thorax were synchronical, and on the contrary. At last the Ventricle of the Heart was opened, to feel the muscular Force, and so an end was put to both his Respiration and Life.

I was before of Opinion, that a Man, or other more perfect Animal, (for as to Frogs, and such like, it is quite otherwise) could not live, if the Air was admitted into both Cavities of the Thorax. But these Experiments show how erroneous this Opinion is. They seem at the same Time to contradict the justly received Doctrine of Respiration; that the Lungs are dilated by the Weight of the Air entering thro' the Larynx, when the Pressure of it on their external Surface is removed by the Dilatation of the Thorax. But I think this seeming Contradiction may be thus removed, or at least diminished.

Let us suppose both Wounds to be double the Aperture of the Glottis; but the Lungs to be entire, and destitute of all contractile Force, and let the Thorax be now dilated, and filled by the Lungs distended with Air. Then,

1. At the first Contraction of the Thorax, the Air will go out through the Glottis only.

2. When

2. When the Thorax is dilated again, the Air will enter in Proportion as it's Capacity is increased; but it will not all enter through the Glottis, nor all through the Wounds, but through each of their Apertures, according to their Proportion; and the Quantity which shall enter through the Glottis, will be to the Quantity which shall enter through the Wounds, as the Aperture of the Glottis to the greatest Aperture of the Wounds; or, in the present Case, as 1 to 4. Therefore the Air, by which the Lungs are now inflated, will be $\frac{1}{5}$ of the Quantity by which they would have been inflated, if the Thorax had remained entire.

3. When the Thorax is contracted a second Time, the Air must go out by the same Passages, through which it entered in the preceding Dilatation; and if the Apertures remain unaltered, the Air, which entered by the Wounds, must go out of them exactly in the same Time, as the Air entering by the Glottis goes out through the same. Hence no Air will remain between the Lungs and the Pleura, but every thing will be in the same State as at the end of the first Contraction; and if $\frac{1}{5}$ of the usual Inflation of the Lungs is sufficient for the Life and Voice of the Animal, or if it can dilate the Thorax 5 times more than usual, then Nothing hinders but that it may live and form it's voice, notwithstanding this Opening of the Thorax.

I supposed one thing, which is evidently false, that the Lungs are destitute of all contractile Force; which would overthrow every thing, if no Compensation was made; but it is manifest that the Aperture of the Glottis can be contracted or dilated at the Pleasure of the Animal; and, indeed, dilated whilst the Air is inspired, and contracted whilst it is expired, at least whilst the Voice is formed. Hence the Entrance of the Air may be as much assisted by the Dilatation of the Glottis, as it is hindered by the contractile Force of the Lungs, and it's Egress hindered as much by the Contraction of the Glottis, as helped by the Contraction of the Lungs. The Balance, also, may be preserved, or either Cause prevail, according as the Animal has this Power of changing the Glottis, or shall make use of it. This, also agrees very well with the Phænomena; for when the Dog howled his Lungs burst out at the Wounds, but when he was silent, they went in again.

As to that Phænomenon of the Lungs being seen to dilate when the Thorax was contracted, I believe it happened, only, because the Muscles of the Abdomen being contracted by a great, and almost, convulsive Force, thrust every thing upwards, and much diminished the Capacity of the Thorax; wherefore the Air being driven from the lower Parts of the Lungs tended upwards; and the Lungs, tho', with Regard to the whole, contracted, yet were dilated towards the Wound.

In *Exp. VI.* It is self-evident, that the white Body was the Lungs, and the red the Diaphragm; also, that the Lungs fill the whole Thorax, and are applied by their Surface to it's Membrane, as is commonly believed.

There

There are some other Difficulties still remaining, which may be removed by more accurate Experiments, and better Understandings*.

* See the Appendix to Dr Hoadley's Lectures on the Organs of Respiration, 4to. 1740.

C H A P. IV.

The A B D O M E N.

Of an Obstruction of the Biliary Ducts, and an Imposturation of the Gall Bladder, discharging upwards of 18 Quarts of bilious Matter in 25 Days, without any apparent Defect in the animal Functions, by Claudius Amyand, Esq; Serjeant-Surgeon to his Majesty, and F. R. S. No. 449, p. 317, Aug &c. 1738.

I. 1. **M**R La Grange, aged about 50, of a fallow bilious Complexion, died of an Abscess in the *Vesica Fellis*, May 29, 1733. Dr Vatas, his Physician in Ordinary, reports, that about 14 Years before, this Gentleman was afflicted with a Tertian Ague, which was cured by the Bark, and from that Time had complained of a Sense of Weight, and some Uneasiness and Hardness in the Region of the Liver and *Bor-borygmi*, which were relieved by frequent Purgations; notwithstanding which, he had enjoyed all the Appearances of Health, till about 4 Months before his Death, when some Symptoms of the Jaundice first began to appear on him, which had greatly increased 5 or 6 Weeks before he died, when he began to complain of shooting Pains on the Right Hypochonder, which was soon followed with a hard inflammatory Tumour there, tending to Suppuration. May 4, I met Dr Vatas, and Mr Fiquel, his Surgeon, in order to open a large Abscess pointing below the Cartilages of the second and third spurious Ribs on the Right Side. 'Twas determined to open it immediately with a Lancet, whereupon a Pint of a purulent fetid Matter was discharged. The Aperture being large, and the Dressings easy, by the next Day we found, that a very large Quantity of *Sanies*, and some *Pus* left in the Bag, had found a Vent; and this was so great, that 'twas though proper to renew the Dressings twice a Day. This had the desired Effect so far, that from this Time the Matter daily decreased till May 12, when we were informed, that during the Night the Wound had discharged near 2 Quarts of Matter of a saffron Colour, intermixed with large Flakes and thick Lumps of a coagulated Lymph or Gelly, tinged of a deep Yellow; and what surprised us no less, was, that upon Dressing we made way for the Discharge of about a Quart more of the same, as we enlarged the Orifice of the bursten Bag, to favour the coming out of the large Flakes and Lumps of Gelly obturating at times this Orifice. During this Day the Discharge was exceeding great, and at Night was emptied about a Pint more of the same Matter. From this Time a short and thick *Canula* was left in the Opening of the bursten Bag, this causing a more easy and constant Discharge, and a vulnerary Injection, strongly saturated with Spirit of Wine, had the good Effect to diminish it very considerably; but yet it continued so very great, that we had just Reason to apprehend

our Patient would soon sink under so great a Flux of this bilious Matter, and the rather that his Stomach and his Rest failed him; but the Discharge daily lessening, and his Appetite and Rest returning in Proportion, he recovered Strength enough to be able to walk. All this while the Appearances of the Jaundice were wearing off, the Urine was returned to it's natural Colour, and the Patient had regularly a natural Stool every Day, till about 8 Days before his Death, when his Body becoming costive, the Physician found it necessary to discharge the *Fæces*, by Clysters and lenient Purges. Whilst I attended him, his Belly was always free from Fulness or Tension, being soft and lank, and he less troubled with Wind, than he had been for many Years before. Two Days before he died, he went to air himself in another Room, and caught cold: This is presumed to have occasioned a Fever followed with a Lethargy, in which he continued till May 29, when he died.

Dr Stuart and Dr Vatas, Mr Fiquel, myself, and several more, attended the Dissection, when it was observed, that our Patient was not nearly so extenuated as might have been expected, after so great a Discharge of Bile and Lymph during 25 Days; for much Fat was yet observed under the Skin and elsewhere, and his Flesh not much sunk from the natural State, but the Blood-Vessels were found extremely empty. The *Abdomen* being opened, the Caul or *Omentum* was shrivelled up, and adhered to a great Bag or *Cystis*, affixed to the Inside of the great Lobe of the Liver, and stretching from thence along the Right Flank, over one half of the Kidney on that Side. The Left Lobe of the Liver was removed from the Left Side to the Right, not reaching farther than the Right Edge of the *Cartilago Ensiformis*, and the *Pylorus*: The *Ligamentum latum suspensorium hepatis*, was drawn backwards into the Right Hypochonder. The Liver was of a natural Colour, but very small, and more decayed and wasted in Proportion than the other *Viscera*, but as free as they from any preternatural Adhesion, Obstruction, or Induration, and the Bag or *Cystis* arising from it, strongly adhering by it's Outside only, to the *Peritoneum*, down to the Right Kidney.

Upon passing my Finger through the Wound in the Integuments, it entered first into a Cavity made between the *Peritoneum* and the Outside of the *Cystis*, in which the Matter of the Abscess had been lodged, and then through a Hole in the *Cystis*, or grand Bag, through which the great Collection of Bile in this *Saccus* had afterwards made it's way; and it was observed, that the strong Coalition of this Bag to the *Peritoneum* round that Part where the Pus had been collected, had shut up all Communication with the Cavity of the Belly, and thereby prevented any Extravasation into the *Abdomen*.

Now the Bag or *Cystis* being separated from the *Peritoneum*, and this and the Liver spread on a Board, it was observed that the Matter had been collected in the Gall-Bladder, without affecting the Liver itself.

self. The *Vesica Fellis* was become a very large Bladder, and extended so as then to appear capable of containing 3 Pints, or more; it was nearly as broad as long: It arose very broad from the inner Surface of the Right Lobe of the Liver, which it occupied about 10 Inches in Circumference, or more: It's Bulk had removed the Stomach and *Pylorus* from their natural Situations, and pressed them far under the Left Hypochonder, and that Part of the *Colon* placed naturally on the Right Kidney, forwards upon the Spine: It's Surfaces were rugged and unequal, as that of a *Potatoe*, and it's Coats thick and horny, forming several Tumours, Elongations, or Expansions, of different Sizes and Figures; one of which, as large as a Hen's Egg, was full of a cretaceous Matter, intermixed with hard white Stones. This cretaceous Bag was made in the Duplicature of the *Vesica Fellis*, but had no Communication with nor Opening into it, which several other Tumours appearing of the same Kind, had; whence 'twas presumed that some very small Pieces of *Creta*, found in the great Bag, might have dropt from them into it, but 'tis more likely we had dropt them there, because nothing like them had been discharged through the Wound. The outward Opening in this Bag answered in the Cavity of the Abscess, wherein Incision had been made, as this latter was formed between it and the *Peritoneum*. In the Bag were found about two Ounces of the same bilious Matter which had all along been discharged; which being computed, must be equal to, if not exceed, the Quantity of 18 or 20 Quarts, during the 25 Days the Patient lived, from and after the opening of the Tumour.

It has been observed, that the Liver was in a natural State, and that the Matter collected in the *Vesica Fellis* had not in the least wounded or affected the Liver itself; so that the great Quantity of Bile and Lymph daily discharged through the Incision, must have proceeded from the internal Surface of the distended Gall-bladder. This put us upon enquiring for the *Radices Cysticæ* and *Hepati-cystic* Ducts; I mean for those very Ducts which *Giovanni Caldesi* has so carefully traced in several Animals, and delineated in his *Observatione Anatomice al illustrissimo Sig. Francisco Redi* 1687. and which *Verheyen* has discovered in the *Bullock* Kind, but could not trace in Man; these Ducts, I say, whereby so great a Quantity of Gall had been deposited in the *Vesica Fellis*, for as much that the *Cystic* Duct was obturated, whereby some Anatomists have supposed the Gall to flow back from the Hepatic Ducts; and upon Dissection, we traced a Trunk like unto that, which *Bidloo* and *Winslow* observed in Man; and resembling that formed by several Branches in the Liver, and discharging itself into the *Vesica*. We would gladly have traced this further, but the Time allowed for Dissection did not permit us to pursue this Inquiry.

The *Ductus Communis Choledochus* was found empty, and opening, as usual, into the Cavity of the *Duodenum*; but the *Cystic* Duct was so compressed by the Bag, that nothing could pass through it. The Spleen

Spleen, *Pancreas*, and all the other *Viscera*, were in a natural State, saving (as hath been already observed) that some of them had changed and altered their natural Situations.

Upon the whole it appears, 1st, That the animal Functions have been in no-wise vitiated by some of the *Viscera* having been displaced; and notwithstanding that for 25 Days, the Discharge of the Bile thro' the Wound had been so great, that little was left to pass into the *Duodenum*, nevertheless he digested his Food well. The Stools continued regular, till within a few Days before Death, and even to the last the Fæces all along retained their natural Colour. 2^{dly}, It may be observed, that the Jaundice in our Patient was not occasioned by the Obstruction of the Cystick Duct, though that is apprehended as a common Cause of this Malady; for this Obstruction must have been of many Years standing, and our Patient's Jaundice was of a very late Date. Nor was his Jaundice owing to any Retention of the Bile in the *Porus Biliarius*, from the Tumour continually pressing that Duct, and thereby obstructing the free Discharge of the Bile from the Glands of the Liver into the *Duodenum* and Gall Bladder; nor even to the strong Compression and total Obstruction of some, yea almost all the Biliary Ducts, viz. The *Pori Biliarii*, the *Ductus Hepaticus*, the *Hepati-cystici*, and the *Ductus-cysticus*, and *Communis Choledochus*, the principal of which are seated in the Concavity of the great Lobe of the Liver, under the Pressure of this great and hard Tumour, and under it's Increase for near 14 Years together, Obstructions and Compressions generally accounted as primary and idiopathick Causes of the Jaundice, because no Distemper like the Jaundice had appeared in our Patient till within a few Months before his Death, and no true Jaundice till within a few Weeks, and only then as the Abscess formed in the Neighbourhood of the Liver, had brought an Inflammation there; but as all the Symptoms of his Jaundice began to wear off, soon after the Pus had got a Vent, viz. as the Inflammation of the Liver brought on occasionally by a Suppuration in the Neighbourhood wore off, and some Days before the bursting of the *Vesica Fellis*, it does not appear unlikely, this Inflammation of the Liver was the Pathognomonic Cause of the Jaundice here; which Inflammation of the Liver, as it was accidental, so the Jaundice occasioned thereby was actually removed soon after a Vent was made for the purulent Matter which had occasioned this Inflammation.

The Draughts were done by Memory, we not being permitted to take the Liver out of the Body.

A. The external Surface of the Right Lobe of the Liver. B.B. Parts of the same. C. C. The Ligament which suspends the Liver to the *Diaphragm*. D. D. The Ligament which suspends it to the *Cartilago Ensiformis*. E. Part of the *Vesica fellis* below the Liver in it's Fore Part, emptied of it's Contents, arising from the Concavity of the Right Lobe, 10 to 12 Inches in Circumference. F. F. F. F. It's Ad-

Explanation
of the Fi-
gures.
Fig. 95.

hesions to the *Peritoneum*. G. An Opening into the External Bag or *Abscess*, or Incision into it. H. H. H. H. H. Elongations and Inequalities in it. O. O. O. O. The Angles of the *Cystis* opened, shewing in it's back Parts an Elongation opening into it at P.

Fig. 96.

A. A. A. The concave Side of the Liver. B. The *Vena umbilicalis*. C. The *Vesica biliaria* emptied, which when full covered almost all the Inside of the Right Lobe on it's back Part. D. D. D. D. D. D. Several Elongations or Expansions of the *Vesica* opening into the Gall-Bladder. E. The cretaceous Bag in it's Duplicature full of Chalk, intermixed with hard white irregular Stones.

Some Observations on the Case of Mr Le Grange, by Alexander Stuart, M. D. F. R. S. &c. *Ibid.* p. 325.

2. The Symptoms during Life, recited by Mr *Amyand* in the foregoing Paper, and the Appearances in the Body opened, which I was Witness to, therein likewise fully narrated, I hope it may not be unacceptable to point out what appears to me to be the mechanical and necessary Connexion between these apparent Causes and their Effects, in this uncommon Case.

As to the original or prime Cause of all the Symptoms, to wit, the Distention of the Gall-Bladder, now become a morbid *Cystis* of an enormous Extent.

If we consider the Size and Figure of the Liver, and Situation of the Gall-Bladder, with the Course or Direction of the Biliary Vessels, from various Places of the Liver towards that narrow Space where the *Pori biliarii* open into the *Cystis*, it will appear, that in almost every Position of the Body, at least in an erect, supine, and lateral Position, some of these biliary Ducts terminating in the Gall-Bladder, are perpendicular or nearly perpendicular to the Horizon and to the *Cystis*: Therefore, as far as Gravity takes Place in the Animal Oeconomy, the Bile descending by these Ducts, will press upon the Contents of the full *Cystis* and it's Sides, as a Cylinder of that Fluid, of the Length of the Secretory Ducts or Pipes, and of the Diameter of the *Cystis*.

Besides this, the Extremity of every one of these small Ducts, conveys it's Fluid into the full *Cystis*, as a Wedge acted upon by the repeated Strokes, Impulses, or Pressure of the circulating Blood of the *Vena Porta*, where it supplies the Gland at the Origin of each secretory Duct.

Therefore, by the known Laws of Hydrostaticks and Mechanicks, it is apparent, that the Force of this Secretion of the Bile into the Gall-Bladder is very great, and the Quantity copious; sufficient at least to distend the *Cystis* to an enormous Pitch, where the Discharge by the *Ductus cysticus* is not equal to the Secretion by the *Pori biliarii* and the *Ductus hepatico-cysticus*.

These Powers mentioned do sufficiently account for the Distention of the *Abdomen* in an *Ascites*, of the Womb in Gestation, of the Bladder in a morbid or voluntary Retention of Urine; also, of morbid Impostems or Tumours, and of the Gall-Bladder in the Case before us.

But this Distention could never have happened, without a total or partial Obstruction of the excretory Duct, the *Ductus cysticus*.

Had

Had this Obstruction been at once total, as when a Calculus is thrown suddenly out of the *Cystis* into the Duct, and stops it totally, he must have had the Jaundice immediately, or very soon after: For, notwithstanding the strong Powers above-mentioned, it would have been impossible for the Sides of the *Cystis* to have yielded to such a sudden Dilatation, no more than the Womb in the first Week of Gestation, can be dilated to the Pitch it is brought to in the Ninth Month, without a Rupture: So that the Dilatation here must have been very slow and gradual, and therefore the Obstruction must have been at first, and probably for many Years, only partial; and the Gall-Bladder thus slowly distended, gradually yielded and gave way only for the Reception of the Excess of the Secretion beyond the Excretion, and so prevented the Jaundice, or Regurgitation of the Bile into the Blood.

This partial Obstruction of the cystic Duct may probably have been occasioned by one of those small soft incysted Tumours, lodged between the Membranes of the *Cystis fellea*, near the Origin of it's excretory Duct, containing a soft white pultaceous Matter, with *Calculus's* or chalky Concretions in it's Centre. If this was the Case, it is conceivable that while the Contents of this small incysted Tumour was fluid or soft, it might not be capable to obstruct totally the Current of the Bile through the excretory Duct: But as the Matter of it grew thicker, and it's Bulk increased by pressing gradually more and more upon the Duct, the Obstruction must increase; and the Formation of the *Calculus's*, by their Pressure, must at last make the Obstruction total. But as the cystic Duct was at opening of the Body entirely coalesced and obliterated, it's Vicinity and Situation, with respect to these small incysted pultaceous and cretaceous Tumours, cannot be precisely determined; and therefore this is offered only as a probable Conjecture.

The Bulk, Contents, and Adherences of the Gall-Bladder to the Right-side, were without doubt to him a very sensible, and to us a visible Cause of his first Symptom, the increasing Weight he had felt in the Region of the Liver, for 14 Years before his Death.

The Current of moving Humours in the Animal Body, is always determined most strongly to the Place of least Resistance: Therefore by the partial Obstruction of the cystic Duct, a greater Quantity of Bile than usual will be forced upon the biliary Ducts, leading directly from the Liver into the great hepatic Duct, to discharge itself by the *Choledochus communis* into the *Duodenum*, sufficient for the moderate Uses of the Animal Oeconomy; though not so perfectly sufficient, but that the peristaltic Motion in our Case felt the want of the cystic Bile, or at least the Defect of it, so far as to become weak and imperfect, too weak to propel the Excrements, or keep the elastic Air within due Bounds; and therefore the Patient must be subject to flatulent Distentions, and some Degree of Costiveness, only to be relieved by supplying the want of a sufficient natural Stimulus of the Gall, by the artificial Stimulus of Purgatives and Clysters, to assist from time to time the Expulsion both

both of the Excrements and also of the Flatus's, for the Ease of the Patient, as was practised in this Case.

As to the Jaundice which began to shew itself 4 Months before his Death, and continued increasing till the external purulent Tumour in his Side was opened, when it began to decline, and quite disappeared soon after the Gall-Bladder burst.

It is easy to conceive, that so long as the Gall, descending from the *Pori Biliarii*, could make it's Way into the *Cystis fellea*, and dilate it, there could be no Regurgitation of the Bile into the Blood, and therefore no Jaundice: But so soon as the purulent Impostem began to form itself in the Neighbourhood and Contact of the distended Gall-Bladder, it inroached or pressed upon the *Cystis fellea*, by the Force of a Multitude of Vessels, pouring Pus into the Cavity of the Impostem, urged on by the Circulation of the Blood, which is more forcible in these Vessels than in those of the Liver: and therefore this purulent Tumour increasing, will very forcibly inroach on the *Cystis fellea* in Contact with it, and not only hinder it's farther Distention, but even force the Gall it contains to regurgitate, or return again by the *Pori biliarii* upwards, and from thence by the Capillaries of the *Vena cava* into the Blood, and so produce the Jaundice; without raising an Inflammation or Obstruction in the Liver itself, whose Vessels and Passages remain open, though the Bile take a retrograde Course in it's biliary secretory Ducts.

But so soon as this accessory Pressure is taken off from the *Cystis fellea* by opening and emptying the purulent Tumour or Impostem in it's Neighbourhood, adjoining and adhering to it, the Bile begins again to flow freely into the *Cystis fellea*, and to dilate it as before; therefore the Regurgitation of the Bile into the Blood ceaseth, and the Jaundice begins to decline.

Then so soon as the Rupture or Bursting of the Gall-Bladder happened, and it began to be emptied, all Degrees of Resistance being now totally taken off from the *Pori biliarii*, they spew out their Contents so copiously, that the Hepatic Ducts are gradually frustrated by such a strong Revulsion; the Bile begins to flow all to the wounded and almost emptied *Cystis biliaria*, and either very little or none to be carried by the *Ductus hepaticus* to the *Choledochus communis*, whose Diameter and Passage into the *Duodenum* we found larger than usual, but empty. In this State, which was the last Stage of his Distemper, the peristaltic Motion begins to fail, the Expulsion of the Excrements to be very tardy, or not at all to succeed without the Assistance of purging Medicines or Clysters, which also had but a very slender Effect; the Patient ceaseth to be nourished, tho' he took a competent Quantity of Food, and dies in a Week after this Costiveness began.

The Degree of Perfection of the Natural, Vital, and Animal Functions in this Person, during 14 Years Indisposition, was certainly owing to the Soundness of all the *Viscera*, and an almost sufficient Secretion and Excretion of Bile by the *Ductus hepaticus* into the *Choledochus communis*, whose

whose Cavity and Passage into the *Duodenum* was large and open, which could not have been and have continued, without a continual and proportional Flux of Bile through it: For it is well known, that so soon as the Fluids cease to flow through their natural Ducts, their Sides soon collapse, coalesce, and at last totally shut up. Thus the *Urachus*, and *Canalis arteriosus Botalli* in the Foetus, shut up totally soon after the Birth; and Mr *Amyand* and I have lately seen one of the Ureters totally coalesced and shut up, for want of a Fluid from the Kidney, which had secreted no Urine for some time, having become a *Cystis*, filled with a thick white pultaceous Matter, nearly of a cretaceous Consistence.

Therefore as the *Ductus cysticus* was found obliterated, and the *Choledochus communis* large and open, it is plain that no Bile had for some time flowed through the former, and that there was a constant Supply from the *Ductus hepaticus* to the latter, for the Uses of the animal Oeconomy; until the Wound or Rupture of the Gall-Bladder, gradually abating it's Current by that Channel, at last stopped it quite, and put an End to his Life in a few Days after.

II. On the 5th of Jan. last, I was called to *Thomas Conway*, who had received a Wound with a Skane, or great Knife, which went through the muscular part of his Fore-Arm, and into the Left Hypochondrium; it was 24 Hours after he had receiv'd the Wound before I saw him (living 12 Miles distant from me). I found the Spleen out at the Wound, and that what by pressing and thrusting of it with the Fingers, endeavouring to return it into it's Place, which they that were about him could not accomplish, and by being so long exposed to the Air, it was quite cold, black, and mortified. I considered that cutting away the mortified Part, must be attended with the greatest Danger, and was to me, an unprecedented Case; yet that the Patient must inevitably die, if it was not done: I therefore made a Ligature with a strong waxed Thread, above the unsound Part, and cut off $3\frac{1}{2}$ Ounces of the Spleen: Notwithstanding the Ligature, there was a pretty large Artery that sprung with great Violence, which I immediately tied up; and, after bathing all the Parts with warm Wine, I returned the remaining part of the Spleen into it's Place, leaving the Ends of the Threads out of the Wound, to draw them away by when they should digest off, which they did on the 10th Day, and came away with the Dressings: I dressed the Wound with Digestives, and the *Abdomen* was stuped twice a Day with an emollient Fomentation, and after stuping it was always malaxated with an emollient Liniment, which he told me always gave him Ease. What he most complained of, was that he could not make Water, for which I every Day gave him a Carminative Clyster, which kept his Belly from swelling; and always when the Clyster came away, he got some Water made along with it: This Symptom went off on the seventh or eighth Day. He is now perfectly well recovered, following his Business, and finds no Inconvenience from the want of the Part of the Spleen which he lost. The Wound through his Arm was also quickly cured.

An Account of
the Extirpation
of Part of the
Spleen of a
Man, by Mr
John Fergu-
son, Surgeon,
No. 451, P.
425, Dec.
1738, dated
Strabane, Feb.
18, 1734-5,

The Case of an extraordinary Dropsy, by Tho. Short, M. D. No. 466. p. 223. Read Nov. 18, 1742.

III. Last *January* I was called to visit a young Woman of 30 Years of Age, who about 7 Years ago, had like a severe Fit of the Stone in her Left Kidney, with all the common Symptoms of a Stone, but by some Means recovered again. Three Years ago she had another Fit, but got better in a few Days; though she mostly complained of a dull Pain in that Place ever after. When I saw her, I found her *Menses* had been very irregular and small since her last *Paroxysm*, and totally obstructed since *September*; her Pulse very small and quick, her Countenance pale and languid; a Pain at the Pit of her Stomach, towards the Spleen, besides that in the Kidney; her whole Stomach and Belly full, and somewhat swelled, but harder on the Left Side than the Right; a Fluctuation of Water or Matter among the *Abdominal* Muscles, and the *Peritonæum* very hard under it: The Right Side was full, and softer. She had no Appetite, little Sleep, a small Cough, a little Thirst, slight Fever, and much Pain. I ordered her some laxative, aperient, attenuating, diuretic Pills, with an antihydrotic stomachic Mixture, the Country Air, and daily moderate Riding. She pursued this Method a few Weeks with some Advantage, but not so much as she expected and desired. Then she took the Advice of another Physician, to no better Purpose. In *April* I was consulted again by her. Her Flesh was now much shrunk, the Belly fuller, Pulse quicker, Pain the same, Urine scanty, but pale, Appetite languid. I prescribed other Things to the same Purpose as above, but with no better Success. In *June* I put her on drinking *Nevil-Holt* Water (which last Year had cured 3 of Dropsies, which was all had used it for that Purpose) and riding: Upon this she made Water freely, slept tolerably well, had a better Appetite, less Pain, and much chearfuller; but the Swelling of the Belly was still the same. Always on turning her in Bed, she heard and felt a Jolting and Fluctuating of Water in the Belly: This put her on being tapped, not doubting but she would recover then. Next Day I was sent for to see the Water drawn off, *July* 23, but to my Surprise, on the Perforation, between 3 and 4 Pints of very thick, ropy, mixt Matter came away; some was Matter, some a thick white Slime, but the greatest Part was a thick, reddish-brown Liquor, like Liver mashed with a little Water: It could not get through the Canula, without often clearing it with a Goose-quill. After this came near 6 Pints of clear Water or Serum, as in a Dropsy. She seemed much easier then, all the Afternoon and Night; next Forenoon not so easy, though she came down Stairs to Dinner. Quickly after it, she was most severely and violently seized with such excruciating Pain all down the Left Side to the Foot, as threw her into the most profuse Sweat, often Faintings, Vomitings, &c. At 4 o' Clock, she wholly lost both Sense and Motion of that Thigh and Leg, at 5 she was insensible, and at 6 she died, *July* 24th.

Next Day the Body was opened before me, when a monstrous Tumour on the Left Side of the Belly shewed itself, and a large Bag of Water on the Right Side appeared, which two filled the whole Cavity.

The

The *Abdominal* Muscles on the Left Side were very large, flabby, bloated, and a livid pale. The *Peritoneum* uncommonly hard, thick and scirrhus; the Liver and Spleen both much emaciated; the first not above 2 Pound, the last about 2 or 3 Ounces; the Stomach and Intestines, from the *Cardia* to the *Anus*, full of small, hard, white, scirrhus Knots, like small Peas, or Hailstones; the Intestines of a dusky yellow Colour: The Remains of the *Omentum* were mortified: The Kidneys were found: The *Pancreas* very small and yellow. The Tumour on the Left Side (which was the *Ovarium*) being cut up, some Pints of the same Matter as was first drawn off in Tapping, run out: It was divided into innumerable Cells, full of different Matter, some as above; some white, thick Slime, some fatty, some purulent, &c. The Partitions between the Cells very strong, cartilaginous in the Middle, so as to resist the Knife; like muscular Flesh below and above this Cartilage, so was each Cell. The whole *Ovarium*, before it was first broken, might weigh about Twenty Pound Weight. The Bag of Water on the Right Side, was the other *Ovarium*, wherein was nothing but like a large Ox Bladder, containing 9 or 10 Pints of Water; like a Bladder at the lower End, and rising up like a crooked Horn at the other End; the Skin was very thin and smooth. The *Vesica urinaria* and *Uterus* were both found.

From the abovementioned Account you will see, 1st, That here was a triple Dropsy, *viz.* One intermuscular on the Left Side of the *Abdomen*; one in the Cavity of the Belly; one, and the largest of all, in the Right *Ovarium*. 2^{dly}, As I have before observed the like in some others, in much the same Condition; in barren Women, and stale Maids, Tapping should be very cautiously undertaken: Especially when the whole Belly is not equally distended, and not a free Fluctuation of the Water heard and observed from Side to Side, as the Sick turn in Bed; but especially if there was, or is, a sensible Difference to be felt in the Hardness or Softness of the Parts of the Belly, before it is distended monstrously.

IV. *March* the 26th, 1739, the Wife of Mr *Matth. Wilkinson*, of *Long-Sutton*, in *Lincolnshire*, was tapped for an *Ascites*, proceeding from frequent *Hemorrhages*, and a too liberal Use of small Liquors. She was between 30 and 40 Years old, of a very low Stature, and always of a weak Constitution. The Water was all taken away at one Time, and measured 5 Gallons. She was very faint immediately after the Operation, and remained so for near 3 Weeks after. But, by great Abstinence from Liquids, excepting *Lower's* bitter Infusion, and sometimes a Spoonful or two of Cordial Julap, she perfectly recovered her Health again; and to a much better Degree of it, than she had enjoyed for many Years before; without any Appearance at all of a Return of the abdominal Tumour to this Day. The Water was clear, and readily turned to a strong Gelly upon heating it; and I am very certain, there was unavoidably left in the Abdomen a Quantity sufficient

An Ascites cured by Tapping, by Hen. Banyer, M.D. No. 471. p. 632. Reads Dec. 22, 1743.

Of a Person who had taken several Ounces of Crude Mercury.

cient to prove the Existence of absorbent Vessels. Perhaps those Patients, in this Distemper, whose Water turns to a Gelly, have a better Chance to be cured by *Paracentesis*, than others, whose Discharge is more like Urine, and will never curdle by Heat. But Time, and repeated Observation, must confirm this Opinion.

An Account of what was observed upon opening a Person who had taken several Ounces of crude Mercury internally; and of a Plumb-Stone lodged in the Coats of the Rectum, by the late Dr Madden, Physician at Dublin. No. 442. p 291. July, &c. 1736.

V. I was present, with Dr *Robinson*, and Mr *Nichols*, our Surgeon-General, at the opening the Body of a Gentleman of Note in this Town, who, for several Years, had found great Difficulty in going to Stool. This Disorder increased upon him towards the latter End of his Life, and he was seized with a violent Distemper, of which I can give you no Description, having never attended him.

In order to procure a Passage downward (which I suppose was a principal Complaint) he took, by the Advice of a Physician, since dead, several Ounces of *crude Mercury*, at different Times without any Relief, and at length died.

Upon opening the *Abdomen*, which was very much distended, there burst forth a great Quantity of Wind, though the Guts and Stomach were not wounded.

The Stomach was empty; and upon opening it we found the inner Coat very much inflamed from one End to the other. We observed in several Places of the small Guts some scattered Grains of *crude Mercury*, and along with them we generally found a black gritty Powder, very like *Æthiops Mineral*, which was, without doubt, the *Mercury* changed into that Consistence.

The *Colon* was distended, at it's Origin, to twice the Thickness that an ordinary Man's Arm has about the Shoulder. This extraordinary Thickness extended itself about the Length of 10 or 12 Inches; from hence it gradually decreased, and where it was attached to the Stomach, it had not above a third Part of that Size.

It was much inflamed at it's Origin, and contained at least six Quarts of liquid Excrement, in which we observed *crude Mercury*, and also some of the black Powder mentioned above.

The *Colon*, where it parted from the Stomach, and diverged toward the left Kidney, adhered about the Space of 3 Inches to the *Omentum*; and upon separating the Adhesion, we found an Abscess and Inflammation, which had communicated itself to those Parts of the *Ileon*, which were contiguous to the *Colon*.

The *Colon* had in this Place a Perforation about three Quarters of an Inch in Diameter, and four smaller Perforations, about the Size of a Goose Quill, through which some Excrement had passed into the *Abdomen*.

The Coats of the *Colon*, as it approached the *Intestinum rectum*, began to grow scirrhus, about the Space of 6 Inches, and the Capacity became gradually smaller.

The Valves of the *Colon*, about this Place, were of a reddish Colour, and were more scirrhus than the other Parts of the *Intestine*.

The

The Coats of the Colon, where it was continued to the Rectum, were at least half an Inch thick, and it's Capacity was not above the fourth Part of the natural Size.

Upon cutting the Gut horizontally hereabout, we perceived a Body which stopped the Passage, and seemed to the Touch almost of a Cartilaginous Consistence. Having opened the Gut Lengthways, we found it was no more than two of the *Valvula Conniventes Coli*, which were grown scirrhus, and were protruded downward into the Rectum.

We also found a small Plumb-Stone in this Place, which was quite buried in the *Tunica Villosa*, and had made itself a Bed between the Coats of the Rectum. It had likewise formed a small Abscess, which discharged itself into the Cavity of the Pelvis, but had not any Communication with the Cavity of the Rectum.

VI. John Spilman, Bricklayer, of Maldon, came to me Octob. 3, 1734, having a sinuous Ulcer in his Rectum, about 2 Inches from the Anus. This had remained a Twelvemonth, and was taken for the Piles, and treated as such, both internally and externally. I soon perceived a Tumour in his Buttock 2 or 3 Inches from the Anus, which coming to Suppuration, I opened it by Incision; and after dressing it several Weeks with little Prospect of Success, I discovered at the Bottom of the Ulcer something that looked like a Bone, which when extracted, proved to be the lower Jaw of a Fish, as a Whiting, or young Cod, &c. And unquestionably this was swallowed at least a Year before it came away, because the pricking Pain he felt when the sharp End of the Bone stuck in the Rectum, was the Symptom mistaken for the Piles; and when this had made it's Way through the Rectum, and got into the fleshy Part, the Aposthume followed in course; and the Bone being extracted, the Ulcer was soon cicatrized by the common Methods of Cure in such Cases.

The Jaw of a Fish taken out of an Ulcer in the Rectum, by Bezaleel Sherman, Surgeon, at Kelvedon, in Essex. No. 453, p. 139. April, &c. 1739.

VII. Octob. 8, 1735. Hanvil Anderson, a Boy, 11 Years of Age, was admitted into St George's Hospital near Hyde-Park Corner, for the Cure, of a *Hernia Scrotalis*, which he had had from his Infancy, and a Fistula between the Scrotum and Thigh terminating into it, which for a Month last past had discharged a great Quantity of an unkindly sort of Matter. The Rupture was small, and not troublesome, and Part of it could be replaced, but as it appeared that the Sinuous Ulcer sprung from that Part that could not; so 'twas evident that the Cure of the Fistula depended upon the Cure of the Hernia, which latter could be obtained by no other Operation than that for the *Bubonocoele*, which was agreed to, and performed Dec. 6, following.

Of an Inguinal Rupture with a Pin in the Appendix Cœci incrusted with Stone; and some Observations on Wounds in the Guts; by Claudius Amyand, Esq; Serjeant-Surgeon to His Majesty, and F. R. S. No. 443, p. 329, Oct. 1736.

This Operation proved the most complicated and perplexing I ever met with, many unsuspected Oddities and Events concurring to make it as intricate as it proved laborious and difficult.

This Tumour, principally composed of the Omentum, was about the Bigness of a small Pippin: In it was found the Appendix Cœci perforated by a Pin incrusted with Stone towards the Head, the Point of

which having perforated that Gut, gave way to a Discharge of Fæces through the fistulous Opening therein, as the Portion of the Pin obturating the Aperture in it shifted it's Situation. The Abscess formed in the Hernial Bag occasionally, and the Suppuration for 2 Months last past from this Place outwardly, had knit and confounded, and, as it were, inbodied together the Gut and Omentum with the Hernial Bag, and these with the Spermatick Vessels and the Testicule, so that it was as difficult to distinguish them from each other, as it was to separate them without wounding them; this Pin, whose Point was fixed in the Omentum, continually shifting it's Situation, and occasioning a Discharge of Fæces. The Pin frequently lying in the way of the Knife, and starting out of the wounded Gut, as a Shot out of a Gun, the Inundation of Fæces upon this Occasion from a Gut we could not well distinguish, were so many Difficulties in the way: But the greatest yet was, what to do with the Gut, which all this while was unknown, and of which we could not come to the Knowledge, 'till the Operation was over; for this Appendix Cœci, which was the only Gut found in the Rupture, was so contracted, carnous, duplicated, and changed in it's Figure and Substance, that it was impossible to determine what kind of Gut it was, or to find out that it was only this Appendix elongated, and in Disguise.

We apprehended none of these Difficulties, when we undertook this Operation, in which we proceeded as usual: The Omentum lying uppermost in the Hernial Bag was dissected from the Parts it was knit to, and particularly the Gut it was inbodied with, and afterwards cut off close to the Abdominal Muscles without any previous Ligature, the Vessels in it being small, and the Substance of it more like a Sweet-bread than the Caul.

Much Time was spent in this Dissection; we were streightened for Room, and greatly disturbed by the Discharge of the Fæces coming out of the Gut, upon every Motion the Pin lodged in it and the Omentum suffered, upon the Separation of these from each other. The Gut forming a double Tube, like a double-jointed Syphon, continuing in the Curve as it passed over the Testicule and Spermaticks, was separated one part from the other and from the adjacent Parts, as far as the Aperture in the Abdominal Muscles, where the unperforated End of it was separated therefrom, and thence stretched out and unfolded, which brought in View the Aperture made in it by the Pin hitherto concealed, thro' which that Part of it, which was incrusted with Chalk, had just made it's way out upon an occasional Pressure, as a Cork out of a Bottle. It was the Opinion of the Physicians and Surgeons present, to amputate this Gut: To which End a circular Ligature was made about the sound Part of it, 2 Inches above the Aperture, and this being cut off an Inch below the Ligature, was replaced in the Abdomen, in such a Manner that an artificial Anus might be made there, if the Patient's Case should require it. Afterwards so much of the Hernial Bag as had been detached from the Skin, the Spermaticks, &c. was cut off, which, as they appeared

appeared in a sound State, were preserved *in Situ*. The Fistulous Opening adjoining to the Thigh, and answering to the Aperture in the Gut, was opened; some Angles of Skin in the way removed; The Aperture in the Muscles, which had been enlarged by Incision, was stopped up with a Tent, and the rest of the Dressings and the Situation of the Patient ordered so, as to remove from the Wound all such Pressure from within as might disturb the Cure.

'Tis easy to conceive that this Operation was as painful to the Patient as laborious to me: It was a continued Dissection, attended with Danger on Parts not well distinguished: It lasted near half an Hour, and the Patient bore it with great Courage. During it the Patient vomited largely, and had several Stools, but was soon composed by half an Ounce of Diacodium, and Emollient Embrocations and Fomentations, frequently applied warm on the Belly: He was blooded, and an Emollient Carminative oily Clyster was ordered to be applied in the Evening; but as he was easy, and the Belly not tense, that was omitted. He was confined to a very sparing Diet, and his Body kept open by Clysters, injected every 2d Day, when Stools were wanted, to prevent straining. When dressed upon the 4th Day after the Operation, every thing appeared well, and we had good Reason to hope for a Cure, especially as the Discharge by the Anus was natural. The Tent put into the Abdominal Aperture was not removed till the 8th. Upon the 10th the Ligature round the Appendix Cœci, where it had been amputated, dropt off, and no Fæces followed it; and as it was then plain they had taken the natural Course, from that Time the Wound was treated like an ordinary one, saving it was observed to keep a strong and constant Pressure over the Abdominal Aperture, as well to fence against the Intrusion of the Viscera into the Wound, as by a strong Incarnation and Cicatrix, effectually to secure the Patient against a Rupture. During the Time of the Cure he was confined to his Bed, always kept to sparing Diet, and ordered never to go to Stool but in a Bed-pan; by these Means the Wound was completely healed up in less than a Month, and the Patient soon after discharged with a Truss, which he was ordered to wear some Time, to confirm the Cure.

That the Appendix Cœci should be the only Gut found in this Rupture, is a Case singular in Practice: This was full of Excrements, and occasionally could be distended with an additional Quantity, which upon Pressure was returned into the Colon, with that kind of Noise which Guts replaced generally give. This had occasioned a Diminution of the Tumour when compressed, before the Operation was performed, as the Patient was lying backwards with his Head downwards, and an Increase of it as he stood erect, when the Fæces from the Colon could get into it again.

The Patient does not remember, when he swallowed the Pin which had perforated the Gut within the Rupture. But as this Rupture was from his Infancy, fixed and unreducible, so it is likely the Pin had then made

made it's Way into the Appendix Cœci prolapsed ; and that an Inflammation ensuing thereon, had occasioned an Adhesion, whereby the Increase of the Tumour had been checked, and the Reduction of the Parts prolapsed thereby, rendered impracticable.

The Surgeons who constantly dressed the Patient before the Operation, did observe then, as they have since, that the Humour discharged formerly at the Fistula, had frequently the Appearance, and, as they thought, the Smell of Excrements, so that there is no Doubt that the Cause of it was the Wound made in the Gut, by the Pin giving way occasionally to such a Discharge. The Patient also perfectly remembers, that the Imposthumation or Gathering preceding the fistulous Discharge was attended with very little Pain, or much less than generally attends Suppuration. Which shews that the Extravasation of the Excrements from the Gut into the Hernial Bag, and the bursting of this Bag, were the Cause of the fistulous Discharge, and of the continuance of it outwardly.

As to the Pin found in the Rupture at the Time of the Operation, it is observable, that $\frac{2}{3}$ of it, incruited with a chalky Matter, were confined and concealed within the Gut ; the other Third next the Point, had made it's way through it, the Point of which was so lodged in the Omentum wherein it was fixed, as to leave a free Passage for the Excrement from the perforated Gut outwardly, whenever the Perforation in the Gut, upon shifting the Position of the inclosed Pin, could open, and afford a Passage for the Discharge of the Fæces this way, which was as oft as this conical or pyramidal Pin did alter it's Place, or did not exactly obturate the Aperture in the Appendix Cœci, it exactly fitted. I have already observed, that the Aperture made in the Gut by the Pin lay concealed, the Point being lodged in the Omentum, lying parallel with the Gut, which was here duplicated, where it was so secured, that it seemed almost impossible it could ever make it's way out of this Place, and it's other Confinement in the Gut, as the Aperture was callous, and so resisting that it was with some Violence it was forced out of it's Confinement through an Aperture fitted for the Point only and so streight, that the Report upon it's coming out was like that of a Cork out of a Bottle ; for though it appeared the Opening had occasionally been enlarged, as the incruited Part of the Pin was pressed forward into it, yet it is plain Nature's Attempts to get rid of it had been fruitless, and might possibly have been so during all the Patient's Life.

Sir *Hans Sloane* has furnished the Curious with Instances of Bodies incruited in the Guts with Stone, and of some making their way out, when there was little Probability of it. Daily Experience shews how far Nature will struggle to free herself, so that it is always most eligible to trust them to her Care : This may appear from the Difficulties that have attended the Cure of this Case, which at last did not prove so successful as it was first hoped for ; for the Patient having been remiss in the wearing of his Truss, upon some Effort the Guts found a way into the Inguen again,

again, 6 Months after the healing of the Wound. This Case also shews that the best Operation, and the utmost Care, is no Security against the Relapse of a Rupture. This is the 3d or 4th Instance I have met with, of the Insufficiency of this Operation to effectuate a Cure of Ruptures; and yet it is plain, this is by far more likely to prove effectual, than the Caustick or any other Method cried up for the Cure of this Evil. In a growing Age, a good Spring Truss is an effectual Remedy; and in an Adult, this should be the ultimate one, though it is no more than a Palliative Cure.

N. B. The Omentum and the Gut amputated, with the Pin perforating it, are in the Repository of the Royal Society.

This Observation puts me in Mind of two I made during the late War in *Flanders*, and of two more lately in *London*.

Upon opening the Body of a Soldier who had laboured many Years with an Inguinal and Scrotal Rupture, I found in a Segment of the Ilium, an Appendix like a Cœcum, about 6 Inches long, arising from that Gut, and nearly of the same Diameter with the Gut itself, the Coats whereof were somewhat thinner than those of the Ilium this Cœcum did arise from, whose Membranes and Dimensions were Natural. This Elongation of a Segment of the Ilium appeared as if it had been lodged in the Rupture Bag it lay near to, and into which it had been stretched along the Vagina of the Spermatick Vessels down to the Testicle, according to the Expansion of the Rupture Bag, which was of the same Dimension: This Production of the Ilium, or *Appendix Ilii*, was full of Fæces, somewhat narrower at it's Rise or Opening into the Ilium than elsewhere, but nearly resembling it, and as sound as that Gut it sprung from. Obs. I.

A Soldier having been shot through the Belly, the Ball was cut out upon the posterior Part of the Os Ilium. Through both Wounds the Fæces were chiefly discharged for several Months after, and at Dressings a great Number of flat Worms, dead or alive, were found upon the Plaister. The Fæces having by degrees taken their Course through the Anus, in 5 or 6 Months after, the 2 Wounds being healed up, the Patient returned to his Duty. And Obs. II.

Eight Years after this, I had him again under my Care at the Hospital, where he was brought with the Head of the Os *Humeri*, together with that of the *Acromion* and Clavicle, in the Articulation with the *Scapula*, fractured by a Cannon-shot, which thereby was laid all open. The Limb was immediately cut off in the Articulation with the *Scapula*, having first premised a Ligature about the Flesh surrounding the Vessels, by thrusting close to the Bone a Pack-Needle armed with a strong Pack-thread, there being no room for the *Tourniquet**: He lost very little more

* Mr *Le Dran*, in his *Chirurgical Observations*, Vol. II. *Observ. 43*. 12mo. 1731. has described the Manner of performing the Amputation of the *Humerus* in the Articulation with the *Scapula*, to which the Reader is referred.

Blood in the Operation, than if a *Tourniquet* had been applied; but the great Discharge of Matter sunk him, and he died the 8th Day after.

The Death of this Patient gave me an Opportunity of examining how the former Wound in the Gut had been cured. I had thought the Wound had been in the Ilium, from the Thinness of the Fæces discharged through that Wound; but, upon Dissection, I found it had been in the Colon in the broadest Part of it. This was very much contracted, and made narrow in that Part of it that had been shot through, where it appeared pursed up, and inseparably knit to the Ilium Bone. However the Patient never had complained of any Inconveniency therefrom, though the Narrowness of the Gut in this Place was such, as seemed to make the Descent of the Fæces difficult.

Obs. III.

Jan. 19, 1729. I attended Miss ——— aged 14, on account of a suppurated Tumour on the Navel, whose Situation was under the *Musculi Recti*. This Patient had had, what is truly called, a Starting at the Navel in her Infancy; and of late had complained, at Times, of a Swelling there, and also of Colicks, Gripes, or Vomitings, that used to go off, particularly as that Swelling disappeared. As these grew more troublesome, she lately had taken a Vomit, from which Time she had been greatly costive, and her Reachings, Vomitings, and Colicks, had proved more constant, together with an increasing Tension and Pain in the Fore-part of the Belly, and a Tenderness at the Navel, as Matter was gathering there.

Some Days before I was called in, Dr *Campbell* had employed the properest Remedies to remove these Complaints. Upon a Consultation, we agreed to discharge by Incision the Matter collected at the Navel, being about a Spoonful of undigested Fluid, that had made its way through the *Aponeurosis* of the Abdominal Muscles adjoining to the Navel Cicatrix. Notwithstanding which, the Tension of the Belly, the Costiveness, the Reachings, and Vomitings, rather increasing, as in the *Miserere Mei*, and having thence a Reason to apprehend a Strangulation and Suppuration of some of the *Viscera* in the Neighbourhood of the Navel, Dr *Hollings* being called in, it was agreed to enlarge the Aperture made by the fore-mentioned Matter in the *Linea Alba*, with a View and Intent to know the State the Parts were in, to reduce what we found there, or at least to procure a more free Discharge to the Matter collected under the *Aponeurosis* of the Muscles: For a Fortnight and more, every Thing was done that could internally or externally ease the Discharge, and open the Passage for the Fæces downwards, but all in vain. The Patient was a whole Fortnight without a Stool, all the Symptoms daily increasing, though towards the latter End she vomited rather more seldom: Yet, as she was still taking in, so the Dimensions of her Belly increased in Proportion, and the more for that the Air confined and rarefied in the Fæces pent in, added daily to the Tension; which at last had stretched the Skin to the utmost. There was also a Suppression of Urine, the Fundus of the Bladder being stretched towards the Navel, at the

the same Time that the Neck of it was compressed by the Fæces bearing down in the Pelvis, and a Tumour sprung up about the Anus, as if they had been seeking a Passage that way. It was proposed to scoop them out, but the Rectum was found empty, and the Obstruction as far beyond the Reach of any Chirurgical Operation, as it had proved against all the Means hitherto employed.

The Patient was now reduced to the lowest Ebb. The Dejections were Excrementitious, her Pulse depressed and extremely weak; she had Rigors, clammy Sweats, and all the Symptoms that denote an approaching Death, from a Mortification in the Guts, when of a sudden the Fæces bursted the Gut, and forcing their way through the Incision at the Navel, a Quantity equal to two or three Quarts, intermixed with various kinds of Fruits and Seeds, which she had been taking during her Illness, flowed out like a Torrent, with a surprizing roaring Noise, which gave her immediate Relief. The Discharge continued very great all that Day, but the Aperture in the Hernial Bag was not answerable to that in the Gut, so that the Discharge there was at Times checked by Substances obturating it; this Aperture therefore was enlarged by Incision, and thereby the Patient released from the Violence of the Vomiting and Hickup. From this Time we began to entertain some Hopes of a Cure; for though the Patient was extremely reduced, and the Discharge continued exceedingly great during several Days, with a Singultus and Vomitings; yet she was refreshed with Sleep, and was able to retain some Nourishment. The Tension of the Belly subsisted, though in a lesser degree, until the Fæces had made their way downwards, and so did the Vomitings at Times, so long as the Inflammation continued. The Diet was such as the Case required; Clysters were frequently applied, as well as Fomentations, and every Thing else that could determine or invite the Discharge through the Anus, and restore the distended Guts to their Tone; but from the Time the Fæces bursted the Gut, it was 12 Days before any took the natural Course; and then we were again brought to the Brink of Ruin, for they then poured down so fast for a Day or two, that the Patient was like to have sunk under them: However, this severe Evacuation was timely conquered by Absorbents and Diluents: It took off the remaining Tension of the Belly, and all Vomitings; and as from this Time the Fæces had a free Discharge the natural way, and the Discharge through the Wound decreased in proportion, so the Wound in the Gut, and the external Wound in the Integuments were healed up in about 3 Weeks, in such Manner that the Patient has ever since enjoyed a most perfect Health.

It happened that I was not a meer Stranger to the principal Circumstances of this Case, as in the Year 1716, I had attended such another with the late Mr. Lafage, Surgeon, viz. Miss ——— a Girl about 4 Years of Age, in whom the same Cause had produced the like Effects; for upon a Suppuration of the Omentum strangulated in the Navel of this Patient, the Fæces detained in the Neighbouring Gut had in like Manner

Obs. IV.

Manner forced their Way through the Navel: The Accident previous to the bursting, and subsequent upon it, having been nearly the same as in the former Observation; only the Cure proved somewhat more tedious, for the Wound was kept open by Currants-Seeds frequently working their way out at the Navel, for about 12 Months after; when it was made complete: So that the Hardships the Patient has undergone since in Child-bearing, and several hazardous Labours, have not been able to disturb it.

Hence it appears, that the Parts inflamed and in Contact have been coalesced and knit together, so as to prevent any Extravasation from the wounded or bursten Gut into the Cavity of the Abdomen.

That the Cure in the two last Cases has been owing to a free Discharge of the Fæces through the Wound, and consequently that when in a Gut Rupture the Part prolapsed cannot be reduced, a Cure may be hoped for by making such an Opening in the Guts, before they are intirely sphacelated, as may procure a free Discharge to the Fæces pent in, and thereby secure the Patient's Life.

That if this happens to the Colon or Cœcum, the Tube of it will so far be preserved as to open a free Discharge for the Fæces the natural way; and if that cannot be obtained in a Wound of the small Gut, yet the Discharge may be secured by making the Wound an artificial Anus.

That the readiest way to obtain a Cure of a wounded or bursten Gut, is to keep it in Contact with the outward Wound, and the Patient in a very low Diet.

That the Deligation of the Vessels of the Omentum previous to the Amputation of it, being liable to many Exceptions, it is more eligible to forbear it, saving when the Vessels are large; for when reduced loose and floating, it is less liable to the Inflammations and Suppurations that attend the Separation of the Ligature.

A Rupture of the Ileum, occasioned by an external Contusion, by Christian Wolfius, Prof. Math. Marburg. R. S. & Acad. R. S. Sc. Paris. Soc. No. 445. p. 61 Jan. Sc. 1737. Dated March 3, 1731.

VIII. A strong labouring Man was bruised by a Stone falling on his lower Belly; he received no Wound by this Accident, and died unexpectedly the next Day. Upon opening the Abdomen, there was found a great Rupture in the Ileum, so that it cohered with the rest only behind, and the Contents being poured forth into the Cavity of the Abdomen, caused an abominable Stink. The Liver was pale, being quite destitute of it's natural Colour; and the same happened to the Lungs. From a livid Spot in the Abdomen, I concluded, that the Stone had fallen with it's acute Angle on the Belly, and that the Intestine was bursten by too great a Tension, as bent Bodies are broken on their upper Convexity.

Of a Bubonocèle, or Rupture in the Groin, and the Operation made upon

IX. I. Oct. 8, 1737, Mrs Bennet of a thin Habit of Body, aged 70, had a Return of a Tumour in the Groin, with unusual Pain, which was soon followed with a cruciating one in the Belly, and such Colicks, Reachings, and excrementitious Vomittings, as usually attend the Strangulation of the Gut in the *Miserere mei*. This came upon her unaware, and

and the Distress she was in, made her forget that for 25 Years last-past, she had had a Swelling in the Groin as big as a Hasel-Nut, which seldom had given her any Uneasiness, and which she never suspected to be a Rupture. Of late she had been more subject to Cholicks than usual, but that was imputed to bad Digestions; and that Day she had used no Motion capable of producing a Rupture: So that it was by chance that Mr Despaigial, who was sent for the next Day, discovered the Cause of the Complaints. She was blooded, clystered, fomented, poulticed, and embrocated; but the Complaints subsisting, with a continual *Singultus*, I was called in, the 11th.

it; by Claud.
Amyand, Esq;
Serjeant-Sur-
geon to his Ma-
jesty, and
F. R. S. No.
450. p. 361.
Oct. &c.
1738.

The Tumour was now oblong, about the Bigness of a Hen's Egg, somewhat inflamed, yet not tense, nor so painful as to take much Notice of it. Upon the repeated Use of the forementioned Means, and of lenient Purges and Opiates, the Vomitings and Hiccough were at times stopped, and the Patient made so much easier, as to ground Hope of Success; but as during 6 Days, the Patient had had no Passage, and the Tumour could not be reduced, so we thought it unsafe to delay the Operation any longer. At this Time she was free from Fever, the Belly was not tense, and she had great Intervals of Rest.

The Tumour felt unequal (though it appeared even) and pappy, as the Tumours of the *Omentum* generally are, and therefore of that Kind that is always most difficult to reduce; the *Omentum* wanting that elastic Springiness which favours the replacing of the Guts. Upon Dissection we found it was embodied in the hernial Bag, and that upon the external Surface of the Slits in the abdominal Muscles, the Folds of it had form'd a round Protuberance, not unlike the *Os Tinca*, in the *Vagina*, or like a *Bourlet*, which, by compressing the Gut, prevented the Return of it into the Belly, and by obturating the Opening, as the Gut was pressed upon it, had strangulated about an Inch of the Gut incompass'd by it in the *Hernia*.

This being the 6th Day from the Beginning of this Evil, the Gut there was found of a very swarthy Colour, but yet springy, so that it was not totally mortified. It lay inclosed in a Net formed by the *Omentum*, as a Fish in a Fishing-net, strangulating the Gut under it's Pressure without the abdominal Muscles: It was with some Difficulty the *Omentum* was torn off and separated from the Bag it was attached to; and as this lay in the way of the Reduction of the Gut, and almost sphacelated, so it was cut off without any previous Ligature, though it's Vessels were turgid and large, as it was impossible to pull it out so as to make the Ligature upon the sound Part of it; after which the Reduction of the Gut might easily have been made, without enlarging the annular Slit; for this made no Stricture to prevent it. But the Quantity of the *Omentum* within it being great and voluminous, and the Gut in a very crazy State, it was thought more expedient to enlarge it, to make the Reduction of the whole easy: Afterwards the *Omentum* was detached from it's Adherence round this Place, and pulled further out;

and a Ligature being made upon the found Part of it, that was also replaced in the Belly, and the Entrance stopped with a conic Tent, dipped in the Yolk of an Egg, and Oil of *St John's-wort*: The Belly was embrocated, and the Dressings well secured; for as the Patient was greatly oppressed with an Asthma, so she was obliged to be sitting in Bed.

From this time the Hiccough and Excrementitious Vomitings have disappeared, but the Reachings and Vomitings continued near 5 Days longer, before the Fæces detained above the strangulated Gut could make their way downwards, though they were frequently invited by Clysters, and lenient Purges. She was blooded immediately after the Operation, and soon after took an emollient and carminative Clyster, which was repeated Night and Morning; and an oily Laxative of ʒij of *Manna*, and ʒss of Oil of sweet Almonds, in Mint and small Cinnamon-water, every 4 Hours. At first the Evacuations were extremely fetid, black, griping, and frequent; but they became more moderate as she took Absorbents and Diluents; but yet so frequent, that it was thought proper to restrain them by gentle Astringents, so that she might be enabled to bear them. In 5 or 6 Days, the Stools had removed the Tension, which appeared on the Belly after the Operations; the Reachings and Vomitings, and the remaining Symptoms, went off; the Wound digested well, and the Patient continued in a mending and recovering Way.

It has been observed, that this old Woman was greatly afflicted with an Asthma; she had, at times, violent Fits of it, and the 14th Day from the Operation she had one, with a total Stoppage of the Discharge from her Lungs, which choked her upon the 17th Day. I should have been glad to have had the opening of her, but could not obtain her Friends Consent.

This Case confirms me in what I have frequently observed upon the like Occasion, that as the *Omentum* is the principal Obstacle to the Reduction of the Guts in Ruptures, so it is the Occasion of the greatest Accidents that attend that Evil. It wraps up and incloses the Gut prolapsed, like a Net, whose fastened End within the Belly strangulates the Part detained in the Rupture without the abdominal Apertures where it is confined; and is productive of such Folds in it, and Pressures of the Gut wrapped up in it, as is oftener the Cause of a Strangulation and *Miserere mei*, than the tendinous Slits of the external oblique Muscles in the inguinal Rupture, or tendinous Opening in the Navel, which upon these seldom is found inflamed, and can never contract so suddenly, as to obstruct the Return of the Gut into the Abdomen, when the *Omentum* is absent: Agreeable to which, it is rare to find any strangulated Rupture that is not attended by it.

The fatty Substance of the *Omentum* subjects it to Inflammations, Suppurations, and Putrefactions, that contaminate the neighbouring Parts. It wants that elastic Springiness the Guts have, which favour the

Reduction in Ruptures. It frequently stays behind when the Guts are reduced, and therefore bars the Patient not only from the Benefit of retentive Trusses he stands in need of for his Security, but it directs the Gut into the Rupture where it lies, the Guts being most apt to slide down along it; and when it is fixed in the Rupture, it too often pulls and draws into it the *Cæcum* and *Colon* it is attached to, and even the Stomach itself, in proportion as the Quantity of it in the Rupture happens to be more or less; and therefore the umbilical Ruptures are most dangerous of any; for as the *Omentum* lies over the Guts, so it is always pressed in foremost, in the Ruptures of this Part, which, when large, will also cause an Elongation of the *Fundus* of the Bladder that way, and a Difficulty of Urine, in proportion as the *Urachus* attached there is stretched forwards towards the Navel.

The Pain attending the *Prolapsus*, soon swells the Vessels of the *Omentum*, and that will fill up the Apertures in the abdominal Muscles, through which the *Viscera* are fallen out, prevent their Return, and bring on an Inflammation. If, by plentiful bleeding, the Vessels emptied do not facilitate the Return of the Parts prolapsed, and all the Consequences that generally are observed upon the like Occasion, and if these do not operate soon, it is very seldom that any thing is got by the Application and Use of all the other Means prescribed. Certain however it is, that 'tis very dangerous to depend too long upon them; and that a Suspension of the Symptoms is no Security, whilst the due Course of the *Fæces* is interrupted. The Case I have here mentioned, may be a Warning to others, not to delay too long an Operation whereby the Parts are to be released from Confinement, and which oftner would be successful, if it was not delayed so long.

In the case of a Rupture with a *Miserere mei*, some deny that Excrements and Clysters from the lower Guts can ascend, and be discharged through the Mouth, upon a Presumption, that the Strangulation that prevents and stops the Descent of a thin Fluid downwards, must prevent the Ascent likewise, and especially of such solid Substances as are reported to be discharged upwards; and the rather, that the *Valvula Coli*, and the Wrinkles or Valves of the Guts, must impede the Ascent: But the Fact is true, and there is no one conversant in Practice, but has seen *Fæces* and oily Clysters discharged upwards.

If this be allowed, it will follow, that in the Gut-Rupture, there is a Passage through their Pipe, and consequently that the Strangulation must be less than it is generally ascertained.

The Inflammation of the Guts inverts, but we do not know how, the peristaltic Action of them, and the Discharge, and that so long as that is continued, insomuch that this will continue even some Days after the Reduction of the Gut is made.

Parts inflamed, and in Contact, will soon stick and coalesce together: Pain is the indicating Sign of Inflammation, and an Inflammation is an Intumescence of the Vessels in the Parts inflamed. If then

Pain happens to be an Attendant of a Rupture, wherein the *Omentum* is concerned, and the Parts so inflamed continue in Contact, that is, if the Parts prolapsed in a Rupture are not soon reduced, they will swell in the Bag, and be knit together, and by filling up the Opening, by which they had prolapsed, choak up the Passage, clog and prevent the returning back, compress the Guts under the Pressure, and strangulate them more and more, in proportion as their Bulk shall increase, so long as the Fluids can flow into the compressed Canals; in which at last they stagnate, and upon Extravasation suppurate, or the Mortification of the Parts compressed ensues.

— by John
Huxham,
M. D. F. R. S.
No. 459. pag.
640. Jan. &c.
1741. Dated
June 8, 1739.

2. Mr *Burman*, a Taylor of *Plymouth*, about 40, had from his Childhood laboured under a small inguinal Rupture on the right Side; but about 6 Years before his Death, from a Blow received in his Groin, the *Hernia* became very large, and the Gut always remained down in the *Scrotum*; for he wore no Bag, Truss, or the like, to support it. The Day before his Death, he was following his Work, as usual, with his Pressing-Iron, without any violent Jerk, or Straining; but, about 10 in the Morning, all at once, he felt a very great Pain in his right *Inguen*; which, continually increasing, in 2 or 3 Hours threw him into Vomitings, cold Sweats, &c. His Apothecary, Mr *Ellery*, gave him a Clyster, which brought off a small matter of thin Stool; but gave no Relief, though it had been formerly very serviceable to him in the like Disorder. About 8 in the Evening I was sent for, and found him in cold Sweats, with scarce any Pulse: The *hernial* Tumour was prodigious large, and exceeding hard; the Pains extremely violent, which caused excessive Languors. I immediately ordered, that he should be placed in a proper Posture, that a warm aromatic emollient Fomentation should be frequently and long applied, and that a Reduction of the Intestine should be attempted; or, if that did not succeed, that the Operation for the *Bubonocoele* should be performed. The Fomentation was tried a long while, emollient *Terebinthinate* Clysters injected, and the Reduction attempted, for an Hour or two, by Mr *John Start*, a skilful Surgeon, but in vain: Nay, the Swelling increased considerably during the Application; and the Pain became (if possible) more aggravated all over the *Hernia*, which before was chiefly at, and near, the Rings of the *abdominal* Muscles; and this too, though he took, with an easy Cordial, and mulled Wine, *Laudan. Solid. gr. ij. 3iis Horis*. Early the next Morning I was desired to see him again; and, finding that he had not slept a Moment, the Tumour considerably increased, and excessive hard, though not discoloured, and the Patient exceeding weak and pained, I advised the Operation forthwith, as the only possible Means of saving him: But he was unwilling to admit of it, and we were all indeed diffident of the Success. Whilst a fresh Fomentation was getting ready, the poor Man expired in Agonies. About an Hour or two after, we opened the *Scrotum*, which in so short a Space of Time appeared all livid, and the Blood-Vessels were extremely
turgid

turgid and varicose. Upon cutting through the Teguments, Part of the *Colon* and *Ilium* thrust out with great Force; they were both prodigiously distended with Wind, highly inflamed, and in several Places very livid. That Part of the Guts, commonly called *Cæcum*, was blown up into a kind of globular Figure, as big as a Child's Head. It was remarkable, whether in the original Conformation, or by the vast Distention, I know not, that there was no manner of Appearance of the *Appendix vermiformis* to be found, though we diligently examined: And further, that the *Cæcum* was vastly thicker set with Glands, and they much larger, than I had ever seen before in any Subject. The Convolutions of the *Ilium* and *Colon* were so immensely distended with Wind, that the valvular Corrugations in both almost totally disappeared. Yet exactly at the *Valvula Tulpii, alias Baubini*, there was a very great Constriction of the intestinal Canal, as if tied strongly with a Cord; and, though we opened the *Colon* about a Hand's-breadth beyond the *Valve*, and let out the *Flatus*, we could not possibly press any Wind from the *Ilium* into the *Colon* through the *Valve*. I suspected indurated Excrement, as an Obstacle; but, on a careful Inquiry, only found the whole valvular Production, and the End of the *Ilium*, at it's Insertion into the *Colon*, highly inflamed, and quite shutting up the Passage. On dilating the Rings of the oblique and transverse Muscles, the Wind rumbled up out of the *Ilium* into the Cavity of the Belly very readily. We found pretty much bloody *Sanies* in the Guts, on flitting them open, but little or no indurated *Fæces*: A manifest Proof, that the exceeding Hardness of the Tumour was owing only to the excessive Flatulence, and great Inflammation; and shews how much we may be deceived in our Conjecture on like Occasions. The Tumour of the *Scrotum* was 28 Inches round. I was much surpris'd to find no Adhesion of the *Intestines* to the containing Parts, though he had so long laboured under the *Hernia*.

This unhappy Case gave me a severe Reflection, and I cannot but think the Malady was much increased by the repeated Application of the hot Fomentations; as it rarefied the Air greatly, and, by relaxing the Parts, gave further Room to the vast Expansion. At that time I had never seen *Belloste's* Second Part to his *Hospital-Surgeon*, where he advises, in such Cases, the most cold astringent Fomentations. In this and the like, they might have been very proper; especially if a Portion of Spirit of Wine camphorated had been added to prevent Mortification.

It sometimes happens, that though the annular Perforations of the abdominal Muscles are dilated by the Operation, yet the *Hernia* cannot be reduced. I believe, as the Guts were distended to so enormous a Bulk in this Man, it would have been impracticable. In such Cases may it not be proper to prick them with a Needle, to let out the *Flatus*, as is commonly practis'd in small Wounds of the *Abdomen*, where the *Intestine* thrusts out, and becomes so turgid with Wind, that it cannot otherwise

otherwise be returned? In some ventral Ruptures (as they are called) this also may be necessary. I find Mr *Sharp*, in his late excellent Piece of Surgery, approves of this Method, from an old *English* Practitioner, who had often used it with Success. I am persuaded, Punctures in this manner are much less dangerous than the Operation; and believe, in such Cases, may be more effectual. It is a common thing with Grainers and Cattle-Doctors, to prick the Guts of their Sheep and Bullocks with great Success, when, by feeding on Clover, or fresh young Grass, their Guts become so vastly distended with Wind, as would otherwise certainly kill them. May not a very small hollow Needle with Perforations, as in that used by some instead of the *Trocar* for a *Paracentesis*, be more proper than a common Needle? May not the hernial Tumour be perceived to be chiefly flatulent by it's being in some Degree transparent upon applying a Candle, as used in the Hydrocele? And may not that direct the proper Place for Punctures?

An Observati-
on on the singu-
lar Conse-
quences of an
incomplete Hernia,
and on the
Functions of the
Intestines ex-
posed to Sight,
by M. Le Cat,
translated by
T. S. M. D.
F. R. S. No.
460. p. 716.
Apr. &c.
1741.

X. *Katharine Guilmatre*, of *St Adrian*, near *Rouen*, aged 50, had a Rupture in the right Groin, for 7 Years last past. At *Easter* 1739, there happened a Strangulation in her Rupture; and, having no Assistance, the Tumour suppurated, and opened of itself. The Excrements followed the Pus, and the Patient escaped at the Expence of Vomitings, and a little Fever.

The Intestine cicatrized with the Integuments, but there remained externally an Opening, through which the Excrements passed. The Anus ceased to perform it's usual Functions; and, that excepted, the Patient was cured.

Towards *Whitsuntide*, there issued out at the Wound, besides the Excrements, a Gut 3 or 4 Inches in length; but this Gut was turned Inside out; that is, the villous Coat was outward, and it conveyed no Excrements; these were always discharged through the Wound, on one Side, and below the Gut that was come out.

In *Aug.* 1739, there came forth at the Wound another Gut, turned as the first, making with it a continuous Canal, but at it's End supplying *Fæces*, which had before been discharged through the Fistula; so that, instead of the Fistula, there was found, as it were, the Trunk of two Intestines, which made a kind of Fork.

The Woman, tired of this Inconveniency, resolved at length to seek Relief at the *Hôtel-Dieu* of *Rouen*. She was brought thither in *Dec.* I was then in the Country; She was told that her Distemper was incurable; and yet she was kept there till my Return, to shew her to me by way of Curiosity.

What was curious in this Distemper, was not an Anus formed contrary to Nature in the Groin (that Accident is pretty common); but it was the two Guts turned Inside out, their villous Coat, and their Functions, demonstrated to the very Eye; as also the *Ænigma* occasioned by these two Guts, which were both of one Piece, as appears in *Fig.* 99. and which notwithstanding had 2 Openings; the lower whereof voided

voided the Excrements, and the upper discharged nothing. I know of no other Person but Mr *Chefelden*, who has observed an inverted Gut in a living Body: But my Observation adds to his, 1st, Experiments on the Action of Purgatives. 2^{dly}, The singular Figure of this *Hernia*, the Discovery of which has an Influence on the radical Cure of this Disease, and on those of the same kind which may possibly happen.

I think I may give the Epithet of *Singular* to this Sort of *Hernia*; because, upon Inspection, one instantly conceives, that the Gut which voided the Excrements was continuous to the Stomach, and the other to the *Anus*. But how was it possible, that these 2 inverted Guts should be of one Piece? Let one imagine a Gut cut through by a Strangulation: There remain 2 Orifices, one that runs to the Stomach, the other to the *Anus*: If the Canal of each of these Orifices turns Inside out, and prolapses, as it happens, to the *Anus*; you then have 2 Guts prolapsed and turned, but they are distinct one from the other, far from being of one Piece. It must be allowed, that the *Ænigma* is puzzling: And indeed, a good Number of Surgeons saw this Singularity, but not one of them accounted for it.

The villous Coat, and the Functions of these *Intestines*, being exposed to the Eye, afforded a Circumstance still more curious and useful. These 2 Portions of Guts seemed to be 2 large living Worms. They move here-and-there, twisting, shortening and lengthening themselves like Reptiles. The lower Gut was much more alive and sounder. One time that I handled it, it twisted round my Fingers like an *Eel*. The upper Gut, that answered the *Anus*, had less Motion, and was beset with Pustules.

The Expulsion of the *Fæces* engaged our particular Regard: We remarked in it's Mechanism 2 Sorts of Motion.

The first is the vermicular Motion, allowed by most Authors. In this, the Gut first swells, and becomes smooth; then grows narrower, running into Wrinkles, and forming Waves the whole Length of the Gut, where these 2 Motions happen alternately. The Streightening is performed behind, and upon the Excrements, to drive them down; the Dilatation happens before these *Fæces*, in order to open them a Passage: For Example: When the *Fæces* were at the Orifice, through which we saw them issue, this Orifice was spread open.

The second Sort of Motion that we observed in the Guts, generally preceded the one above described. In this Motion the Surface of the Gut being swelled and smooth, was rendered uneven by many small Impressions [or Hollows] distributed here-and-there, and which seemed to be formed by little local Convulsions, circumscribed by the *intestinal Fibres*. These convulsive Impressions resembled, in little, those that are made in the *Abdomen*, upon contracting some one of it's *Muscles*. They made the Surface of the *Intestine* a little pale, and thereby formed a sort of Undulation on it's Surface. It was chiefly in this sort of Motion.

Motion, that there was squeezed out of the villous Coat of the *Intestines*, a Mucilage and Serosity, which flowed from it in Abundance. Both these seem to serve for diluting the *Fæces*, and preparing them an easier Passage. The cold Air did not fail to excite these Motions, and the Woman felt some Touches of the Colic.

After having made these Observations on the natural Functions of the *Intestines*, it occurred to my Thoughts to observe the Effect of Cathartics therein. One does not often see the Inside of the Guts of a living Person in good Health, and freely performing his Functions: Wherefore I was willing to make use of so uncommon an Occasion.

First, I put a little Pulp of *Cassia* on several Places of these two Portions of Gut. This Medicine made very little Impression on those Parts; they stirred very little, especially the upper Gut.

Next, I laid on *Manna*. This, when somewhat dissolved, formed a sort of Froth, and then the Gut was agitated by vermicular Motions, and by small convulsive Contractions, much more distinct than in the Conditions I had examined it before.

I took off the *Manna*, and strewed Powder of *Jalap* on the Gut. At first it had no Effect; but, when it was moistened, the Gut was violently agitated, discharged much Serosity, and the Patient complained of Gripings. I removed the Powder, and under it I found a great Quantity of Mucilage, that was already gathered there.

I thought it needless to harass this Woman by further Trials, which would prove much the same with the foregoing; and therefore turned my whole Attention on the Means of curing her of this Accident, and thereby rewarding her for the Services she had rendered us.

The Nature of
this Accident
explained.

At first Sight of this Disease, I was as far as the other Surgeons from comprehending the *Ænigma* of the Figure of the two Ends of the Gut continuous [or of one Piece]. I plainly saw, that they were Portions of the *Ileum*; but I was obliged to meditate on it a second time, in order to guess at the rest; and yet nothing so easy when a Person has hit it off.

The *Hernia* which this Woman had at first, was one of those named an *incomplete Hernia properly so called*; that is, a *Hernia* wherein there was but a Portion of the Side of the Gut pinched within the Ring. This strangulated Portion mortified; the sound Lips cicatrized with the *Integuments*; the rest of the Canal remained within the Belly; and the Excrements, which this Remainder of the Canal received, issued at its Outlet towards the Groin.

The Patient, being recovered, quitted her Bed, and by little and little occasioned the turning Inside out, and Fall of the Portions of the intestinal Canal, situated above and below the open Part. By this Inversion, the remaining Coats of the opened Gut came out likewise. This Part is situated between the 2 Portions, one of which answers to the Stomach, and the other to the *Anus*; and with these 2 Portions it makes but one and the same Part, or a continued Plane: Wherefore it

it was found, out of the Belly, between these two Portions, and formed, as it were, the Trunk of these two Branches.

The Portion, or Branch, corresponding with the *Anus*, must have had less Motion, and be less sound; because it is deprived of the Share of Life that would come to it from the Continuity of the *Fibres* that were pinched and carried off by the Strangulation, and that it is continually exposed to the Air. The other Portion is full of Life, because it's Continuity with the Stomach makes it enjoy all the Life that this Communication can furnish it with; and that besides it remains within the *Abdomen*, while the Patient is in a recumbent Posture.

In order to give the Pupils of our *Hôtel-Dieu* a clear Notion of the Formation of this singular Rupture, I made one just like it on a dead Body. For that Purpose I made an Incision in the *Abdomen*, at the Place of the Rings. I passed into it a Gut, in which I made an Opening. I sewed the Lips of this Opening to those of the Wound of the Belly; and having turned Inside out the Portions of Gut placed above and below this Opening, they afforded us a Bifurcation of Guts continuous and entirely like that of the Observation.

This same Portion of Gut that supplied the *Fæces*, and that was so lively, was drawn back into the Belly, when the Patient lay down, as I have already said; and the other only constantly continued out. This Circumstance made me conceive Hopes of curing this Accident.

Method of curing this Accident.

Thus I reasoned with myself: It is but first making this last Gut enter in, and bringing the Disease to it's first State: Then, seeing there is a pretty large Portion of a Canal still remaining between these 2 Guts, as appears by the Bigness of the Trunk of the Branches formed by them; what remains to be done, after the whole is reduced, is to close the exterior Orifice of this demolished Canal; that is, to close the Opening made by the Strangulation and Mortification; and I conceive, that this last Operation is very feasible. The next thing to be done is to refresh the Lips of the Fistula formed by the Integuments of the *Abdomen*, which are thick enough, and on which shall be afterwards made a *Gastroraphia* proportionate to these Parts.

The great Difficulty is, to reduce this End of Gut, which is grown hard, and full of Tubercles. I have already made a fruitless Attempt, both with Cataplasms to repair the Damages, and with manual Operations proper for making it re-enter. I am actually watching a favourable Moment for this Operation. If I succeed, I intend to stay for making a second Operation, till this Gut has remained long enough in the Belly to repair itself, and resume it's Functions. In order to that, I shall content myself for the first 8 Days, with keeping it in the Belly, applying resolving Fomentations, and giving proper Clysters. Then will I put into the Opening of the intestinal Canal, that answers to the Fistula, a silver *Canula* of the same Bore with the Gut, in order to push this Portion of a Canal into the Belly, to support it therein, and re-establish it's Communication with the Portion newly reduced.

Of an extraordinary Stone voided by the Anus.

This silver *Canula* will be fixed by a Plate of the same Metal, guarded with Plaister and Linen, and placed on the Fistula, where it shall be secured in it's Situation by a Bandage. I shall then redouble the Use of the Clysters, and when I shall be ascertained of the Re-establishment of the Communication of the two Guts, and the Functions of the Portion continuous to the *Anus*; then I will withdraw my silver *Canula*, and will perform the Operation, as I have said above.

Fig. 97.

Fig. 97. The Woman with the *Hernia* in *Situ*.

Fig. 98.

Fig. 98. The *Hernia* represented at about half it's natural Size. A. The lower Part of the Intestine communicating with the Stomach, and emitting the Excrements. B. The upper Part of the Intestine, which is continued down to the Anus, and emits only Mucus, and serous Humours.

Fig. 99

Fig. 99. The upper Part of the Intestine raised up, that the Connexion of these two Parts of the Intestines may the better appear.

A Case of an extraordinary Stone voided by the Anus, by Mr J. Mackarness, Apothecary, in Chip-ping-Norton, in Oxford-shire No. 458. p. 500. Sept. &c. 1740.

XI. Mrs Mary Smith, Wife of John Smith, of Chadlington in the County of Oxon, aged about 31, a tall well shaped strong-made Woman, was seized with a violent Fever, accompanied with great Heat, Restlessness, Pain in the Head, Twitchings of the Tendons, pale Urine, unequal Pulse, Difficulty of breathing, great Costiveness, and without Thirst. She had a hard Labour about 3 Weeks before. This Fever seized her Jan. 2. 1727, and lasted till the 17th, during which Time she was very costive, and continued so till she had another Child, which was the latter End of Feb. 1728, and was frequently subject to Attacks of a Fever, notwithstanding she observed a most regular Temperance: Her Labour was always difficult, and she bred her Children very fast: She lay-in again in Dec. 1728, and in May 1731, and the Child she lay-in with at this Time had a hollow Dent above the Temples, on the left Side of the Head, and is now living. She lay-in again in Sept. 1732, and in Oct. 1733. These two last Labours were the most violent, and the Children had both Dents in the same Place of the Head, the last the biggest, the Hollow being big enough to contain half a small Orange; and the 2 Children were still-born, but alive till the Moment they came to the Birth. In Dec. 1733, she was seized with a Fever, and violent Pains cross her Loins and Back, great Costiveness, Pain at the Neck of the Bladder, and a Pain and Heaviness about the Region of the *Os Pubis*. I took some Blood from her, gave her soft gentle Purges, with the intermediate Use of balsamic and diuretic oleaginous Mixtures and Apozems; but it was difficult to get any common Dose of purgative Medicines to work with her: I then had Recourse to Clysters, but all without any Effect, except that her Fever remitted; but she had no Relief from her Pains, and her Costiveness increased, having no Stool but what was from Purges or Clysters, or both; and the Excrements that came from her were formed in a very odd Figure, like the Leaves of the great *House-leek*, in *Strata*, one on the other; and thus she was for several Months, and then her Urine began to grow fetid, and a slimy Substance fell to the Bottom of the Pot: Her Pains still

still continued; she found no Relief from any Medicines, except Opiates; and these I was obliged to use but seldom, because of her Costiveness. The Stench of her Urine increased, and now a purulent Matter discharged itself in great Quantity: I concluded she had an Ulcer in the Bladder: Mr *Wisdom*, a neighbouring Surgeon, passed a Catheter into the Bladder, and he perceived a Swelling just above the Groin, in the left *Hypochondre*, which was very hard: We advised her to Patience and Resignation, in hopes Nature might point out some Method for her Relief; and gave her no more Medicines, but a soluble Electuary to procure her Stools, which she took every Night. After some time, the fetid purulent Matter ceased from discharging itself in the Urine, but came away through the *Vagina*, after the manner of the Whites. She was quite emaciated, and grown to a Skeleton, by continual Pain, and those Discharges. In *April 1735*, another Turn happened: That purulent fetid Matter, which discharged itself at the *Vagina*, now came through the *Anus*; she complained of a prodigious Weight there, and about the Middle of *June 1735*, she had frequently very bloody Stools, and once a Discharge of more than $\frac{1}{2}$ a Pint of fresh Blood. On the 2d of *July*, having Occasion to go to the Close-stool, as she sat there hard straining, but to no purpose, she thought she felt a hard Substance ready for Expulsion, and sent for her Neighbours, who found a large Substance hard and rugged, (so much, that it tore one of the Womens Fingers, and made it bleed) in the lower Part of the *Rectum*, close to the *Sphincter Ani*. Mr *Wisdom*, the Surgeon, was immediately called, who endeavoured to extract this Substance, and broke some Part of it off, but was forced to dilate the *Rectum*, and so extract it that way. It was a hard, unequal, ragged, flinty Stone, $10\frac{1}{2}$ Inches round, and weighed 3 viijss after it was extracted. The Woman has been easy from that moment, the Wounds are healed, she goes about her Business, has got a good deal of Flesh, and is recovered perfectly, except a Numbness and Contraction she has in some of her Fingers of both Hands and both Feet and Toes.

Fig. 100.

XII. Sir *Rob. Hacket*, an *English Knight*, of a robust Constitution, and good State of Health, except that he was sometimes miserably afflicted with the Gout, lived in *Barbadoes*, where he indulged himself in a liberal Use of Wine. For many Years, when he had drank too freely, he was troubled with the Heart-burn, to remove which, he took Crab's-Eyes, and such like terrestrial Correctors of Acids. Finding some temporary Relief from these, and his Heart-burn returning daily, he took a large Quantity of Crab's-Eyes, Chalk, testaceous Powders, and such like, every Day for several Years. But the Heart-burn increased, and he began to be sensible of a troublesome Weight under the Diaphragm, accompanied with Vomitings, and intense nephritick Pains, till at last in the 56th Year of his Age, and, I think, in the Year 1694, he died in great Torture.

Of Stones in the Stomach and Kidnies, occasioned by an immoderate Use of Crab's-Eyes, and other terrestrial Absorbents, by Jo. Phil. Brey-nius, M. D. F. R. S. No. 459. p. 557. Jan. &c. 1741.

Fig. 101.

His Body was opened by two Surgeons, who found a great Number of Stones, of various Bigness, in his Stomach, the largest of which was branched like a Coral; and though it had lost some of it's Extremities, as appears by the Figure, weighed 3ij and 3v , Apothecary's Weight. It was shewed me by his Son, *William Hacket Esq*; when I was at *Oxford*, in 1703, who also gave me this Account.

Fig. 102.

Another weighed 3j and 3j . The rest were smaller, approaching to a spherical Figure, from the Size of a Poppy Seed, to that of a large Pea.

All these Stones were involved in the Stomach by a very mucous and tenacious Humour, which being dried in the Air upon a Piece of Paper, turned to a Powder very like the Stones.

Their Substance was not all over the same, for they were generally of a whitish and ash Colour; and in some it was of the Consistence and Colour of Occidental Bezoar, and in a very few, especially *Fig 101. a, b*, like Oriental Bezoar; *d* shews the Surface of the Extremity *c* broken off, to discover the inner lamellated Structure.

Fig. 103.

There was a Stone also found in the Kidney, weighing 3iij , which seemed to be composed of 6 Globes, and of a Substance much like those in the Stomach. There is mention of a Stone, not much unlike the first of these, found in the Stomach of a Woman, by *Mr. W. Clerk* * There is another Example of a Stone in the Stomach in the *Ephemerid. Nat. Curios. D. 1. Ann. 2. Obs. 131.* with a *Scholium* of *Phil. Ja. Sachsus.*

Description of
a very extraor-
dinary Stone or
Calculus taken
out of the Blad-
der of a Man
after Death,
by the Mar-
quis de Cau-
mont, in a
Letter to Sir
Hans Sloane,
Bart. transla-
ted from the
French by
T. S. M. D.
F. R. S. No.
450. p. 369.
Oct. &c. 1738.
dated Avig-
non, June 30,
1732.

Fig. 104.

An Account of
the Case a-
bove-mention-

XIII. 1. I send you the Figure of an uncommon Stone found lately in the Bladder of a dead Body, which I had engraven in my own Presence. 'Tis exactly conformable to the Original. The most able Physicians, and the best Anatomists, whom I have consulted on this Subject, assure me they never saw any thing like it of the kind. I can vouch, that the engraving, though very exact, does not come up to this singular Work of Nature; the 10 Branches of which, that spread from the Centre, have some Resemblance with those of certain Plants. It is a matter of Difficulty to me to think, that the System of Juxt-Apposition, which is employed to explain the successive Growth of common Stones, or *Calculi*, can hold good on this Occasion. I dare not however advance, that Vegetation has any Share herein: Though the Shape of the Branches of the Stone, of the Canals, or *Papillæ*, which seem destined to convey the nutritious Juices, do in some measure favour this Hypothesis. I hope, Sir, you will be so kind to give me your Thoughts on this *Phænomenon* of Nature. I thought proper to join to the Figure of the Stone, the Account of the Patient's Distemper, in whose Bladder it was found; as *Mr Salien*, Surgeon of *Lisle* in the County of *Venaissin*, has sent it to me.

2. One *Joseph Vasse*, Inhabitant of *Le Thor*, a small Town at a short League's Distance from *Lisle* in the County of *Venaissin*, aged 66, of a

Fig. 95.

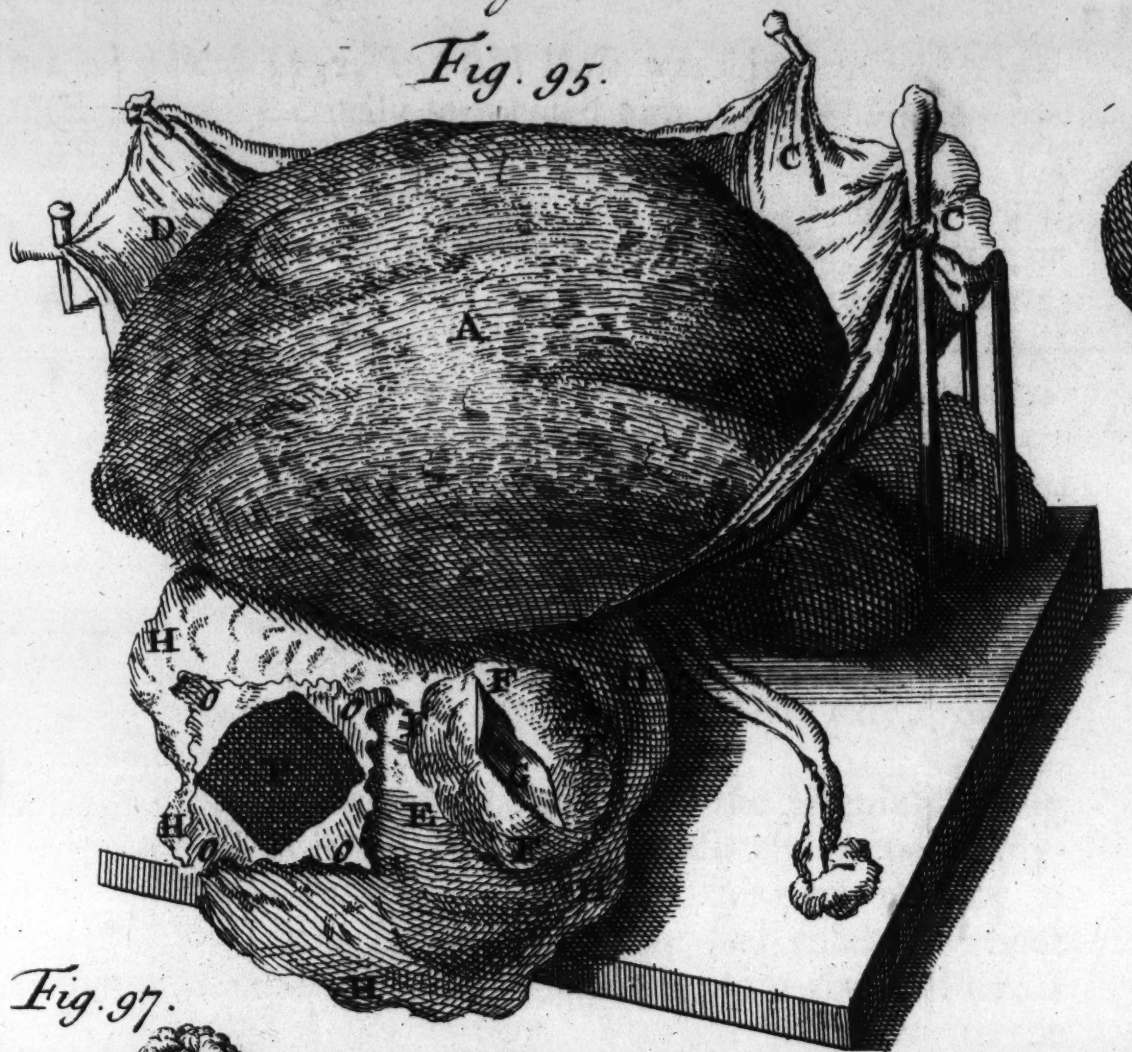


Fig. 96.

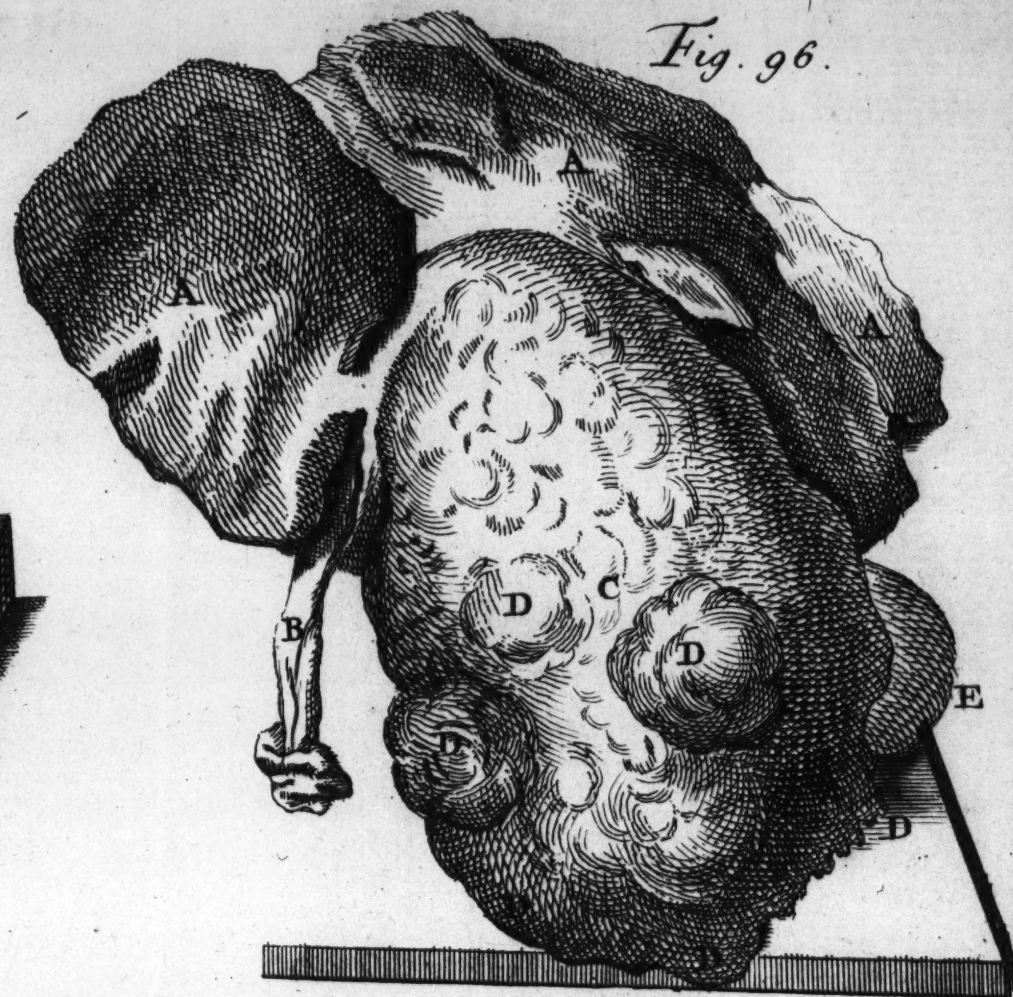


Fig. 97.



Fig. 98.



Fig. 99.

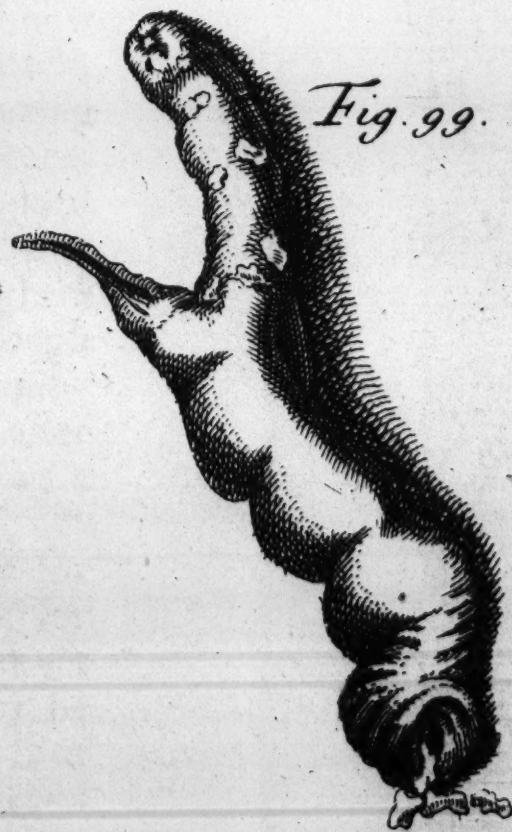
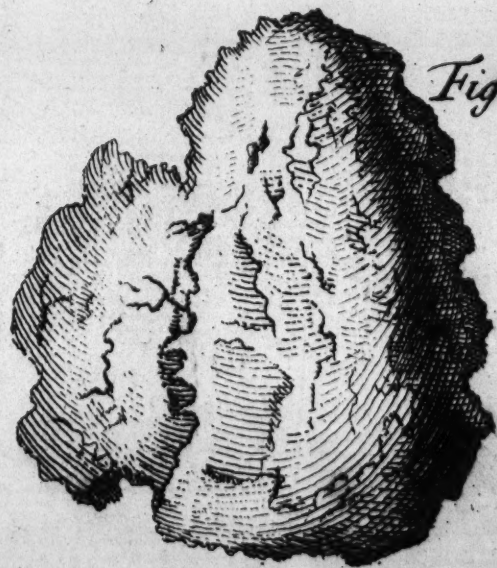


Fig. 100.



A Scale of 6 Inches for Fig.^s 98 & 99.



robust Constitution, who used to travel about to Fairs and Markets in that Country, dealing in Corn and Cattle, without having ever complained of any Indisposition, began Feb. 14, 1731, to feel in the Night-time some Difficulty of making Water, attended with a Smarting about the *Glans*; which however did not hinder him from attending his Business as before.

ed, by M. Sa-
lien, transla-
ted from the
French by Mr
Zollman,
F. R. S. Ibid.
p. 371.

On the 28th of *March* 1732, the said *Vasse* was seized in the Night with a true *Ischuria*, which cruelly tormented him. I was sent for on the 29th in the Evening, to search him, and to draw off the Urine. I drew accordingly 6 Cups, each containing $1\frac{1}{4}$ Pint. The Patient found immediate Ease, and continued without Pains or Fever, so that he thought himself entirely cured. But the Night following the Pains returned, which made him resolve to come to *Lisle*, to be near at hand to be sounded: He came on the 30th, and had his Water drawn off regularly every Day, Morning and Evening, till the 15th of *April* next, during all which Time he suffered no Pains, did not fall away, nor had any Symptoms of Sickness upon him.

On the 15th of *April*, he supped with his usual Appetite; but half an Hour after Supper, he was seized with a violent shaking Fit, which lasted a full Hour, upon which a burning Fever ensued, attended with an unquenchable Thirst, with great Head-ach, and an extraordinary Restlessness.

In this Condition I found the Patient about 8 in the Evening, being the Hour I usually went to sound him. I immediately prepared myself to draw off his Water, according to Custom, thinking thereby to procure him some Ease. Till then the *Catheter* had entered without any Obstacle; but this time, upon my pushing it into the Bladder, I felt a Stone which obstructed its Passage. I turned the *Catheter* to the left, and hit upon one of the Branches of the Stone. In order to know whether there was not another Stone, I drew the *Catheter* a little back, turning it to the right, which was done without any Difficulty; and having pushed it in again, I met with another Branch of the same Stone, which I took for a Stone different from the former, and concluded then, that I had found several Stones in the Patient's Bladder; and that if the bad Symptoms which appeared, should continue any longer, there was no Probability of his recovering. Accordingly, the Hiccough coming upon him on the 20th, and the other Symptoms not discontinuing, he died on the 28th. The Stone was taken out 4 Hours after his Death, in the Presence of M. *Granet* the Curate, M. *Casari* a Burgher of this Town, and two of my Apprentices.

The extraordinary Figure of this Stone will be of no great Use for Practical Surgery; but it may furnish Matter of much Reasoning for Philosophers, to know how it could be formed in the Bladder, and yet not be troublesome to the Patient for so long a Time; what it may be that has given it so particular a Figure, and so regularly shaped. For my own part, I do not question but it was suspended in the Bladder of

the Patient, where it might be framed by the Urine; the dried membranous Filaments, which are still perceived on the Extremities of some of the Branches, are a new Proof of this Conjecture. The Stone happening afterwards to loosen itself, may have occasioned to the Patient all those Symptoms that beset him at last, and afterwards Death itself. This Opinion may appear extraordinary to able Lithotomists, and I willingly submit it to their better Understanding.

Sir Hans
Sloane's Answer to the
Marquis de Caumont's
Letter, concerning this
Stone; translated from the
Latin by Tho. Stack, M. D.
F. R. S. Ibid. p. 374.

3. I am extremely obliged for the Favour of your Lordship's Letter, and the inclosed Figure and Account of a Stone taken out of the Bladder; which is so singular, that among some hundreds of those in my Possession, I have not any that comes near it. Once indeed I had under my Care a Gentleman between 60 and 70 Years of Age, who had extraordinary Difficulties in making Water, and an Inconveniency even beyond that; which was, that he could not sit in an ordinary Chair without suffering extremely in the Region of the *Peritonæum*. With the Help of lenient soft Medicines and Waters, he voided by the *Urethra* a Stone, which was flat in the Middle, and smooth, but had 5 Points, resembling the Rowel of a Spur. The Points of the Rays were sharp, but there was no Asperities or Crystallizations on their Surfaces. It was small, so as after many Days to pass along the *Urethra*: But if it had not passed through the Neck of the Bladder, but remained in the Bladder, it would in all Probability, have attracted Matter to all the Points or Rays, and increased in all Dimensions.

It is very common, that when any extraneous solid Substance gets into the Bladder, there is either attracted to it, or adheres to and surrounds it, a tartareous calculous Concretion, which assumes the Figure of the said Body now in it's Centre, as a *Nucleus*.

There was a Soldier cut in *St Thomas's Hospital, London*, for the Stone, which, when taken out, was found to cover a Musquet-bullet, that had been shot into his Bladder, where it was covered by a calculous Concretion.

I have a silver Bodkin, which a Gentlewoman used for her Hair; and thinking with it to thrust back a Stone that was engaged in the Neck of her Bladder, it slipped into it, and the calculous Matter gathered on the larger End into a Stone of an oblong Figure, and equal Thickness, of half an Inch all round the Bodkin.

I have likewise a common Pin, which by some means or other had got into the Bladder of a young Woman, and was there coated all over by a calculous Matter; but having occasioned a fistulous Ulcer in her Groin, it was discharged thence with the Matter of the *Fistula*.

It is in this manner that Bezoars are formed: for I have the common *East-India* Bezoars, which are roundish, and have in their Centres the Seeds of a sort of *Acacia*, which had attracted, or was coated over by that Substance, esteemed a great Cordial or *Alexipharmic*; while others are long, and are gathered in Layers or Coats upon the Stalks of
Vege-

Vegetables. And I have one formed round the Stone of that great Plumb, which comes prickled from thence, and is called *Mango*.

As to the Asperities or Prickles on the Rays, they are taken notice of, so long since as the Time of *Cornelius Celsus*, who calls them *Calculi Spinosi* *.

It may seem very strange and paradoxical, what I can assure your Lordship is true, that the fewer the Knobs, Asperities, or Prickles, are on the Surface of *Calculi*, the more troublesome they are to the Persons in whose Bladders they lie. Dr *Hickes*, a very learned Divine here, and deservedly famous for his Knowledge in Antiquities and the Northern Languages, was the most tormented with the Stone in his Bladder of any I ever knew, especially upon any Motion. He would not submit to be cut for the Distemper, upon the account of his Age, and many other Reasons; but ordered his Executors, that he should be opened after Death, and the Stone taken out of his Bladder, put into a Silver Box, and given to me, who had been his Physician for many Years, to place it in my Collection of such kind of Curiosities. What is very particular in this Stone, is, that the Protuberances and Prickles upon it were few, and at a Distance from each other. Every one of them had made a Hole in his Bladder, like a Sheath or Socket; and when, upon Motion, they were removed out of their corresponding Sheaths, they hurt the Bladder in the found Parts, and put him upon the Rack of Pain.

When they are thick-set, one hinders the other from entering or wounding so deep; and perhaps gets not much farther than the *Mucus* which lines the Inside of the Bladder.

XIV. I. *William Farman*, of the Parish of *Bayton* in *Suffolk*, was cut for the Stone about 15 Years ago, and a large Stone taken from him.

He says, that he continued easy for about 4 Years after he was cut; that the Wound was quite healed up, and that he made Water in the natural Way, without any Leakage at the Wound.

In July last, he says, he felt great Pain at the Place where he was cut, and that it was much swollen. It looked black, and a little Hole broke open there, out of which the Water came; and a Stone appearing, the Hole grew wider by the Force of the Water, and his frequently touching it, till at last the Stone came away whole. It was broken afterwards by a Fall.

As soon as the Stone was come away he says, that he grew easy, and the Swelling abated. The Wound is now reduced to a small Compass, and the Water still comes away through the Wound, and but very little Water comes out the natural Way.

William Farman is about 30 Years of Age. He says, that the great End of the Stone came away first, which he suffered to lie at the Mouth of the Wound near a Fortnight, but he applied to no Surgeon.

* Lib. VII. Chap. xxvi.

A Calculus making it's way through an old Cicatrix in the Perinæum, by David Hartley, M. A. F. R. S. No. 456. p. 349. Jan, &c. 1740.

the Patient, where it might be framed by the Urine; the dried membranous Filaments, which are still perceived on the Extremities of some of the Branches, are a new Proof of this Conjecture. The Stone happening afterwards to loosen itself, may have occasioned to the Patient all those Symptoms that beset him at last, and afterwards Death itself. This Opinion may appear extraordinary to able Lithotomists, and I willingly submit it to their better Understanding.

Sir Hans
Sloane's Answer to the
Marquis de Caumont's
Letter, concerning this
Stone; translated from the
Latin by Tho. Stack, M. D.
F. R. S. Ibid. p. 374.

3. I am extremely obliged for the Favour of your Lordship's Letter, and the inclosed Figure and Account of a Stone taken out of the Bladder; which is so singular, that among some hundreds of those in my Possession, I have not any that comes near it. Once indeed I had under my Care a Gentleman between 60 and 70 Years of Age, who had extraordinary Difficulties in making Water, and an Inconveniency even beyond that; which was, that he could not sit in an ordinary Chair without suffering extremely in the Region of the *Peritonæum*. With the Help of lenient soft Medicines and Waters, he voided by the *Urethra* a Stone, which was flat in the Middle, and smooth, but had 5 Points, resembling the Rowel of a Spur. The Points of the Rays were sharp, but there was no Asperities or CrySTALLIZATIONS on their Surfaces. It was small, so as after many Days to pass along the *Urethra*: But if it had not passed through the Neck of the Bladder, but remained in the Bladder, it would in all Probability, have attracted Matter to all the Points or Rays, and increased in all Dimensions.

It is very common, that when any extraneous solid Substance gets into the Bladder, there is either attracted to it, or adheres to and surrounds it, a tartareous calculous Concretion, which assumes the Figure of the said Body now in it's Centre, as a *Nucleus*.

There was a Soldier cut in *St Thomas's Hospital, London*, for the Stone, which, when taken out, was found to cover a Musquet-bullet, that had been shot into his Bladder, where it was covered by a calculous Concretion.

I have a silver Bodkin, which a Gentlewoman used for her Hair; and thinking with it to thrust back a Stone that was engaged in the Neck of her Bladder, it slipped into it, and the calculous Matter gathered on the larger End into a Stone of an oblong Figure, and equal Thickness, of half an Inch all round the Bodkin.

I have likewise a common Pin, which by some means or other had got into the Bladder of a young Woman, and was there coated all over by a calculous Matter; but having occasioned a fistulous Ulcer in her Groin, it was discharged thence with the Matter of the *Fistula*.

It is in this manner that Bezoars are formed: for I have the common *East-India* Bezoars, which are roundish, and have in their Centres the Seeds of a sort of *Acacia*, which had attracted, or was coated over by that Substance, esteemed a great Cordial or *Alexipharmic*; while others are long, and are gathered in Layers or Coats upon the Stalks of
Vege-

Vegetables. And I have one formed round the Stone of that great Plumb, which comes prickled from thence, and is called *Mango*.

As to the Asperities or Prickles on the Rays, they are taken notice of, so long since as the Time of *Cornelius Celsus*, who calls them *Calculi Spinosi* *.

It may seem very strange and paradoxical, what I can assure your Lordship is true, that the fewer the Knobs, Asperities, or Prickles, are on the Surface of *Calculi*, the more troublesome they are to the Persons in whose Bladders they lie. Dr *Hickes*, a very learned Divine here, and deservedly famous for his Knowledge in Antiquities and the Northern Languages, was the most tormented with the Stone in his Bladder of any I ever knew, especially upon any Motion. He would not submit to be cut for the Distemper, upon the account of his Age, and many other Reasons; but ordered his Executors, that he should be opened after Death, and the Stone taken out of his Bladder, put into a Silver Box, and given to me, who had been his Physician for many Years, to place it in my Collection of such kind of Curiosities. What is very particular in this Stone, is, that the Protuberances and Prickles upon it were few, and at a Distance from each other. Every one of them had made a Hole in his Bladder, like a Sheath or Socket; and when, upon Motion, they were removed out of their corresponding Sheaths, they hurt the Bladder in the found Parts, and put him upon the Rack of Pain.

When they are thick-set, one hinders the other from entering or wounding so deep; and perhaps gets not much farther than the *Mucus* which lines the Inside of the Bladder.

XIV. 1. *William Farman*, of the Parish of *Bayton* in *Suffolk*, was cut for the Stone about 15 Years ago, and a large Stone taken from him.

He says, that he continued easy for about 4 Years after he was cut; that the Wound was quite healed up, and that he made Water in the natural Way, without any Leakage at the Wound.

In *July* last, he says, he felt great Pain at the Place where he was cut, and that it was much swollen. It looked black, and a little Hole broke open there, out of which the Water came; and a Stone appearing, the Hole grew wider by the Force of the Water, and his frequently touching it, till at last the Stone came away whole. It was broken afterwards by a Fall.

As soon as the Stone was come away he says, that he grew easy, and the Swelling abated. The Wound is now reduced to a small Compas, and the Water still comes away through the Wound, and but very little Water comes out the natural Way.

William Farman is about 30 Years of Age. He says, that the great End of the Stone came away first, which he suffered to lie at the Mouth of the Wound near a Fortnight, but he applied to no Surgeon.

* Lib. VII. Chap. xxvi.

A Calculus making it's way through an old Cicatrix in the Perinæum, by David Hartley, M. A. F. R. S. No. 456. p. 349. Jan, &c. 1740.

An Addition by
C. Mortimer,
M. D. R. S.
Sec. Ibid. p.
350.
Fig. 105.

An Account of
a Stone, or
Calculus, mak-
ing it's way out
through the
Scrotum; by
Mr John Si-
fley, Surgeon,
Ibid. p. 351.

2. I shall add to the foregoing Case Figures of Stones, which made their way through the *Perinaeum* of a Man at *Leyden*, in 1724, and were seen by me there. At A they articulated, or rubbed against each other, while in the Bladder; one having a round Head, the other a Cavity.

XV. Robert Swann, of *East-Malling, Kent*, a hard working Man in the Woods, had a large Swelling on his *Testicles*. On the upper Part of the *Scrotum*, I found a small Hole or two, and he told me, his Urine oused out sometimes. I passed the Probe in, and found a hard Substance, which seemed to be large: I told him he had a large Stone lodged there, at which the poor Man was much surpris'd. I told him, I would make Incision and take it out; he refused to be cut. I dilated it in another Manner, made the Orifice pretty large: The Swelling of his *Testicles* asswaged, he goes to work as usual; about a Week after, coming home at Night with a large Bundle of Wood at his Back, he found himself more in Pain than ordinary; as soon as he got home, he complained to his Wife, and told her he was very much in Pain, went to bed, desired me to be sent for immediately; but before I could get to him, the Stone forced it's way out. It's Weight at first was 3v and 3ij , now almost 3iv and 3vj . This Man lived about 7 Years after this, in a good State of Health, and lived to the Age of 60 or upwards. He told me, he believed the Stone had been growing there for near 30 Years; but never apprehended it to be a Stone, but used to complain of a Weight, as it were half a Pound, carried between his Legs.

An Account of
several Stones
found in Bags
formed by a
Protrusion of
the Coats of the
Bladder, as
appeared upon
opening the Bo-
dy of one Mr
Gardiner, by
Edw. Nourse,
F. R. S. No.
462. p. 11.
Read Jan. 7,
1741-2.

XVI. Permit me to lay before you the Bladder of Mr *Gardiner*, who was, the 5th of *March* 1739, before the Trustees appointed by the Parliament to inquire into the Efficacy of Mrs *Stephens's* Medicines, produced as an Instance, where they had been effectual in dissolving the Stone in the Bladder.

Mr *Gardiner* was searched by me on *Sat. Dec. 30, 1738*. I felt a Stone the Moment my Instrument was introduced; which was likewise felt by Mr *Wall*, his Apothecary, then present.

The *Tuesday* following, he began to take Mrs *Stephens's* Medicines, and continued them 8 Months.

Nov. 30, 1739, I saw him at *Child's* Coffee-House, when he told me, he was quite free from his usual Disorders: I there searched him again, in the Prefence of several Physicians and Surgeons, who likewise felt for the Stone, but none could be found.

Mr *Gardiner* dying on *Jan. 2, 1741-2*, the next Morning, in the Prefence of Mr *St Hill*, and Mr *Wall*, I opened his Bladder, and therein observed 6 preternatural Apertures of different Sizes, the biggest capable of admitting the Top of my Finger. Each of these Openings led to a separate Bag, formed by an Inlargement of the internal Membrane of the Bladder, protruded between the Fibres of it's muscular Coat.

These

These Bags are to be seen on the back Part of the Bladder, a little above the *Vesiculæ Seminales*; and when viewed on the Outside, seem to be but two; though they are in Number equal to the Openings within, already mentioned; and divided from one another by the Duplicature of the internal Membrane, which forms a *Septum* between each of them.

In these *Sacculi*, or Bags, are contained nine Stones; the largest about the Size of a small Nutmeg; and with what Facility some of them moved out of, and returned into, the *Sacculi*, the following Circumstance will clearly evince.

When I had opened the *Abdomen*, Mr *St Hill*, handling the Bladder, brought 2 of these Stones up to it's *Fundus*, where they were felt by Mr *Wall* and myself. We then examined the Kidnies: The right contained a little Matter, otherwise it was as it should be: But of the left, $\frac{2}{3}$ were wasted; it's *Pelvis* was contracted in Proportion, and the *Ureter* almost impervious. Upon rehandling the Bladder, neither of us could feel any Stone; I therefore laid it open, and we found them all in the *Sacculi*. The Stones that are in one of these *Sacculi*, have been so much enlarged since their Lodgment, that without Force and Laceration they cannot be got out.

Fig. 106. *Shews the Bladder cut open.* 1. 2. 3. 4. 5. 6. The preternatural Apertures opening into so many *Sacculi*, in which the Stones were contained. 7. 8. The two *Ureters*. 9. 10. Their Openings into the Bladder. 11. The Opening from the Bladder into the *Urethra*. 12. The prostrate Gland, which was scirrhus and enlarged. 13. The *Urethra* cut off. Fig. 106.

Fig. 107. *Shews the Back-part of the Bladder, upon which the external Membrane being taken away, the Fibres of it's muscular Coat are very apparent.* A. The Fibres of the *Detrusor Urinæ*. B. B. The *Sacculi* formed by the internal Membrane, protruded between the Fibres of the *Detrusor Urinæ*. CCCCCCCCC. The Stones, as they appear in the *Sacculi*, eight in one, and one (the largest N^o 6.) in the other. D D. The *Ureters*. E E. The *Vesiculæ Seminales* turned back, to shew the whole Extent of the *Sacculi*. F F. The *Vasa Deferentia*. G. The Back-part of the prostrate Gland. 1. 2. 3. 4. 5. 6. The Stones which came easily out of the *Sacculi*. 7. One of the Stones sawed, the *Nucleus* of which appears white, and the Surface of them all appears reddish. Fig. 107.

XVII. *William Payne*, aged about 71, had been afflicted with the Stone in his Bladder, and other calculous Complaints, for several Years: He had taken Mrs *Stephens's* Medicines for 15 Months*.

He was subject also to a scrotal Rupture on the left Side, from which however he suffered no great Inconveniency, unless upon Neglect of his Truss, which he had been directed to wear; and even then, if the Intestines came down, he used to return them with Ease.

The Case of Will. Payne, with what appeared upon examining his Kidnies and Bladder, by Mr George Bell, Surgeon, Ibid. p. 54. Read Feb. 4, 1741-2.

* See *Hartley's View*, &c. p. 8. Case III.

About the Beginning of *January* last, he was attacked with a severe Fit of the Stone, attended, upon every Attempt to make Water, with a strong *Tenesmus*, that forced into the *Scrotum* a considerable Quantity of the Intestines, which exceeding his Skill to reduce, he sent for me. I found the Tumour large and unequal, but without much Tension or Inflammation; his Pulse low, with clammy Sweats; he complained of violent Pains in his Back, propagated thro' the whole Length of the *Ureters*, accompanied with Nausea and Vomitings; he felt exquisite Pain about the Neck of his Bladder and *Glans*, with an unusual Weight in *Perinaeo*; he had frequent Inclinations to make Water, but seldom made above a Spoonful at once, and that Drop by Drop, with much Pain, and sudden Stoppings: The Urine was extremely fetid, sometimes mixed with purulent Matter, at others tinged of a Coffee-Colour.

He had received, just before I saw him, a Clyster, which produced two Stools, and encouraged me to hope it might facilitate the Reduction of his Rupture. I attempted it by all necessary Means possible, but without Success: For although the largest Part receded and gave way, yet a considerable Portion remained, which I could not possibly return. I therefore concluded, as the Intestines performed their Office, and were free from Tension, Inflammation, &c. that the Parts adhered; so left him, with Directions for a Bag-Truss to support them.

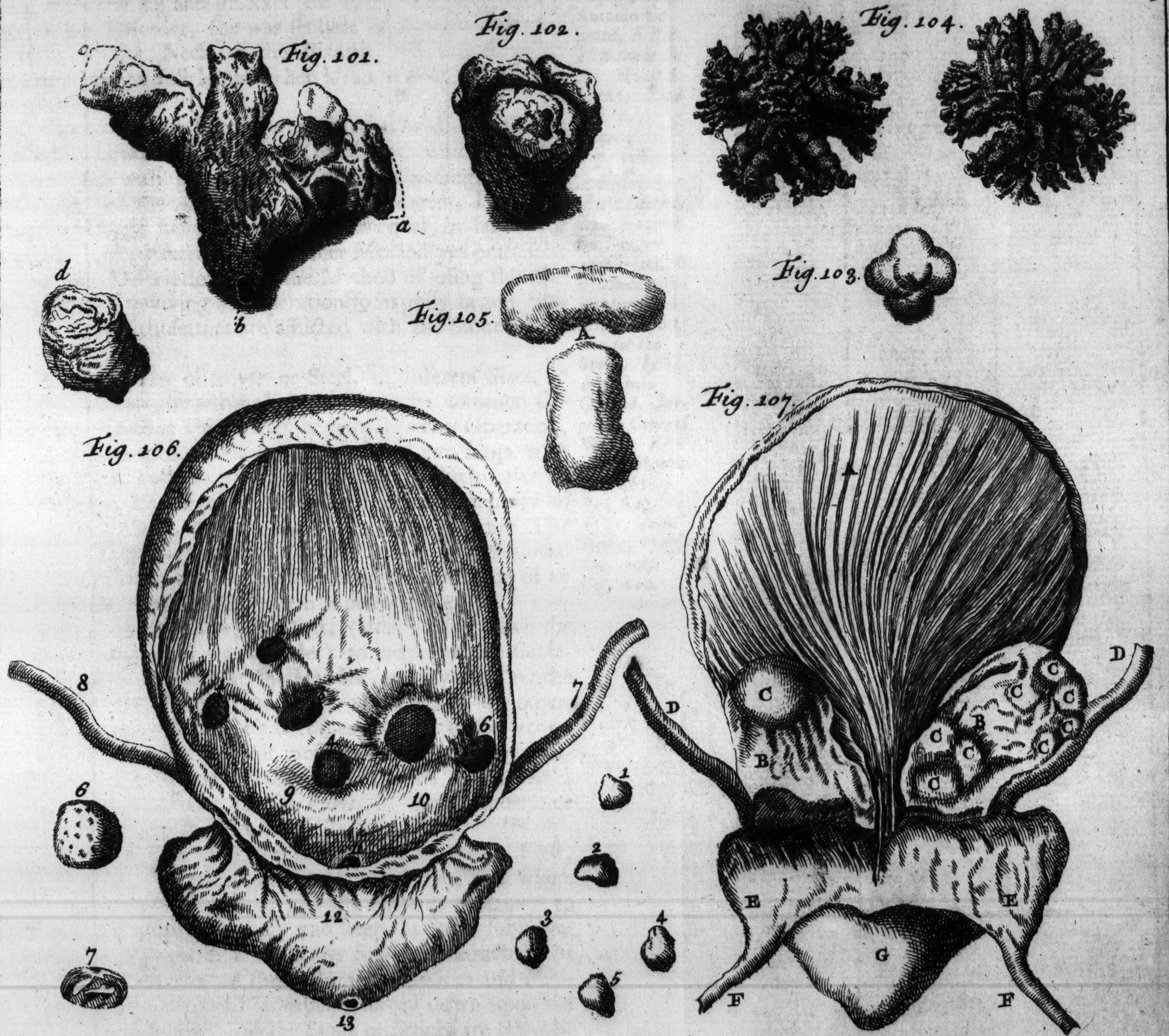
Jan. 22, being informed of his Death, I applied for Leave to open him, which was granted. In examining the Contents of the *Abdomen*, I found the left Kidney quite wasted, scarce any thing remaining except the Coats, and those filled with Blood and purulent Matter; the *Ureter* very much enlarged above it's natural Capacity, and full of the same.

The right Kidney was ulcerated in several Places, and full of purulent Matter, mixed with Grit; several Hydatids appeared upon it's external Surface; the *Ureter* was somewhat enlarged.

I next examined the Bladder, which was exceeding large, and contained above 3 Pints of clear Urine; upon opening it and introducing my Hand, I found two smooth flattish Stones, somewhat larger than common *Windsor Beans*: I discovered a third in the Neck of the Bladder, which probably had been forced there during the Paroxysm, and appeared to me to be the immediate Cause of his Death: It was about the Size of a *Filbert*, and had quite corked up the Passage.

Upon dissecting the hernial Bag, the first Part that presented was a large Piece of Fat, about half a Pound; and immediately underneath it lay a large Portion of the *Colon*, in Length about 10 Inches; the internal Surface of the *Peritoneum* was strongly attached to the *Colon* by several Filaments, and to the *Scrotum* by it's cellular Substance.

All the other *Viscera* were in a natural State.



XVIII. A poor Widow, in the 50th Year of her Age, had been troubled for 40 Months with a very great Difficulty of Urine; when having Occasion to make Water in the Night, she discharged about ℥iij of pure Blood; and at the same time a Stone, shaped as in the Figure, weighing when dry ℥ij and gr. xxix [oz. 1, dwt. 17, gr. 4 Troy]. During the time of her Disorder, she was sensible of a great Weight, and continual Pain, at the Neck of the Bladder, whether lying or standing; and now, after a full Month, her Urine comes away involuntarily, mixt with *Sanies*.

XIX. As this Operation was left off very precipitately, in order to introduce that Method now called the *Lateral Operation*, which has been practised for some time with good Success; notwithstanding, had the Operators at that time had the Advantage of this Instrument, I am persuaded the Advantage would have been more than equal in favour of this *High Operation*, and preferable to any other Method yet practised: And I hope, that the Description, and the Method of using this *Catheter*, will be a means of reviving an Operation so happily begun, and calculated for the Good of those that are afflicted with the Stone in the Bladder.

This *Catheter* is made either of Silver or Steel, of different Sizes, to suit different Ages; and has the outward Appearance of a common *Catheter*, and will answer the same Uses: But, in respect to this Operation, it differs from the common in this, that it is composed of two Legs, with blunt Points, a long Tube, a Sliding-bolt, and a Handle, which serves to open and shut the Legs: The Bolt, which is fixed to the Extremity of the Tube, goes into two Holes, fixed in the Plate of the Handle: The one serves to keep the Legs close during the time it is to be introduced into the Bladder; the other to extend the Points at the Distance of an Inch or more, during the time the Operation is performing.

The Method of using this *Catheter*, is, first, (after having taken the necessary Precautions, and filled the Bladder) to introduce the *Catheter* into the Bladder, then unbolt it at the Handle, and by holding the Tube in one Hand, and the Handle that moves the Legs in the other, then turn or open the Legs, till the Bolt becomes opposite to the second Hole upon the Plate into which the Bolt must be thrust; then by pressing gently the Handle downwards betwixt the Patient's Legs, the 2 blunt Points will be easily felt above the *Os Pubis*, in the Protuberance made by the Injection into the Bladder.

The Advantages I propose by using this Instrument, are these: First, To be a Director for the Operator, in determining the Place where the Puncture is to be made in the Bladder; it also serves as a Support to the Bladder, when the Water flows out; and keeps it from subsiding during the Time of the Operation, and till the Stone is extracted: It serves likewise to resist the Pressure of the abdominal Muscles and *Peritoneum*, and also hinders the *Intestines* from being forced down upon the Knife; and keeps the Orifice open, till the Stone or Stones are brought away.

An Account of a very large Stone voided by a Woman thro' the urinary Passage, by S. Antonio Lepruzzi, F.R.S. Physician to the Pope No. 468. p. 363. Read Jan. 27, 1742-3. Fig. 108.

A Description of a Catheter, made to remedy the Inconveniences which occasioned the leaving off the High Operation for the Stone, by Archibald Cleland, Surgeon to General Wade's Regiment of Horse. No. 461. p. 844. Aug. &c. 1741. dated Ap. 5, 1739. Fig. 109. Fig. 110.

away. And, lastly, by the Help of this Instrument it may be discovered, whether the Bladder is indurated or scirrhus.

The Method of performing this Operation, with Safety is, after having introduced and fixed the *Catheter* with it's Legs open, to feel for the 2 Points above the *Os Pubis*, and place the Finger and Thumb gently upon them; then give the Handle to an Assistant, to keep it firm in that Position; then, with the Knife in the right Hand, make a Puncture at once into the Bladder, exactly in the Middle betwixt the Points; but for the more Security, somewhat lower, near the *Os Pubis*; and, without drawing out the Knife, make a large Incision downwards, inclining under the Arch of the *Pubis*, in proportion to the Bigness of the Stone, taking care not to wound the Cartilage that joins the Bones together, when the Knife is withdrawn: The Bladder being thus supported, the Stone may be extracted with the Fingers, or with a small Pair of Tenets, there being little Danger of breaking it in this Method. When the Operation is finished, raise the Handle of the *Catheter*, and unbolt it; shut it close and fix it so; then withdraw the *Catheter*, and dress the Patient.

Fig. 109. *The Catheter, as it is to be introduced into the Bladder, the two Legs A and B being closed together.*

Fig. 110. *The Catheter, it's two Legs A, B, being open. C, D, The Tube. E, The Sliding-bolt. F, The two Holes into which the Bolt is to be slid. G, The Ears fixt to the Tube C, D, which is all of one Piece with the Leg A. H, The Handle, which opens the Legs; this Handle is all of one Piece with the Leg B, which Leg B is a Continuation of a Wire, that runs through the Tube C D, and is fastened to the Handle H, and turns with it.*

XX. 1. A Widow-Gentlewoman of this Neighbourhood, has voided the Substance inclosed ever since *Michaelmas* last was two Years, unless it were about 9 or 10 Weeks last Summer. She is near 40 Years of Age, and has been married about 17 Years, and had a Child about 12 Years ago, that lived about 9 Weeks.

About *August* last was 2 Years, she was seized with a Stoppage in her Urine, a small Pain in her Bladder, and a great Pain in the Bottom of her Feet, with the making whitish Water like Whey; and she had then a great Weakness in her Limbs, and a Pain in her Bowels; for which another Gentleman, ordered her to go into the cold Bath, by which she found great Benefit for the Pains in her Limbs; but the Pain in her making Water rather increased, and then her Urine began to grow fetid; and about *Christmas* was 2 Years, she voided the largest of the Things you find in the Box, without any very great Pain then, being she had taken a quieting Draught that Night to compose her; but, almost ever since, they put her to most exquisite Pain before she can get them off; and she is commonly forced to take the small Part of the hairy Part between her Fingers, before she can get them off; and oftentimes

Concerning
hairy Sub-
stances, voided
by the Urinary
Passages, by
Mr John
Powell, No.
460. p. 699.
Jan. &c.
1741. dated
Pembroke,
July 16, 1733.

a good

a good deal of Blood comes off with her plucking them, which makes her very sore inwardly.

Upon using gentle Evacuations last Spring was Twelvemonth, she grew much better; such as Vomiting with the *Hypocacuanba*, Purging with *Manna*, Oil of Sweet Almonds, &c. and, taking sometimes Calomel the Nights before, and very often diuretic and balsamic Pills, with and without *Trochise. Gordon.* and emollient Decoctions and Emulsions of several Kinds, the Fetor and Ropiness in her Urine abated, and she was pretty hearty and brisk, so that she undertook last *August* a Journey into *Herefordshire*, and staid there 2 Months, and, I fear, she might take some Cold in her Journey; for her Pains grew worse, and more troublesome, after her return home; and she then voided great Quantities of those large Substances, as well as small; and her Urine grew extraordinary ropy and fetid, notwithstanding all the Endeavours of another Gentleman and myself; and very often the Substance she voided would be so stiff and ropy, that we could scarce separate it from the Pot; at other times so pliant, that you might take it up a great Height with a Sprig of a Broom, or a Feather, and so fall down again like a Lump into the Pot.

She has for this considerable time voided one or more of these hairy crustaceous Substances every Day or Night; they looking, when they are first voided, like Hair and Coralline; and her Pains are so very exquisite, that we are forced, every third Night at farthest, to give her an Anodyne to quiet her; and that often cannot be done, her Pain being so very great.

The Continuance of this severe Pain has brought her to a very considerable Weakness, and almost a total Loss of Flesh; and, what is her great Misfortune, (especially at this Season of the Year) that Milk will by no means agree with her: She has often tried to conquer it, but never could, it constantly making her very sick in her Stomach, and she vomiting it up in great large Lumps.

We have used Injections of 2 or 3 Sorts, but she cannot well bear them; and she has had her *Menses* very regularly, till within the 2 or 3 last Times; and for these 10 or 12 Days past, she has complained of a Swelling in her Belly, but none in her Thighs nor Legs.

One thing I had almost forgot to have told you, that she has often found a *Crepitus*, or a breaking of Wind, as it were, in her Bladder, which would make one believe, that there is an Aperture from the *Intestinum Rectum* to the Bladder.

Her Bladder has been searched, and the Surgeon who did it, assures her, he can discover no Stone; and he is a very ingenious Person in his Profession.

She has for these 4 or 5 last Days complained, at times, of asthmatic Fits, which I must attribute to the Heat of the Weather.

The voiding of these hairy crustaceous Substances never occurred to me in my Practice before; though I have above once had Persons voided large

large Bladders, like the *Hydatids* in Fish, and large Quantities of them, and cured them.

P. S. She drank the Hot-well-waters both at *Bristol* and here, but with little Success; has taken *Cantharides* inwardly, as prescribed by Dr *Groenvelt*, in Ulcers of the Bladder, and all other things we could think of.

Sir Hans
Sloane's Answer to Mr
Powell. Ibid.
p. 703, dated
London, July
26, 1733.

2. I received your's of the 16th two Days since, together with the Box, and Contents thereof; which I have considered, and am satisfied, that the hairy Excretions are generated most likely in her Kidnies. I have seen, in my Practice, some Instances of the like, and have by me what was brought off by Urine from some of them. The first I remember, was from a Gentleman near the *Exchange*, who would frequently, 40 Years since, void with his Urine long Hairs, which were received on white Paper; and the Urine passing off, would remain there, and, by their Transparency and Angles, yielded, on viewing by a Microscope, the finest Colours imaginable, such as we find by a Prism. This Gentleman did not suffer much, though he complained of a Sharpness of Urine. The Person who was affected the most, and applied to me for Help, was a Brewer, who had such Hairs matted or woven together, voided by Urine with great Pain: But then there was no calculous Matter, or very little, added to them. It is very likely, that that Matter is added to those of your Patient in the Bladder, by being retained there. I have a Pin, that a young Woman had swallowed, and was afterwards taken out of her Groin from an Apostem after a Tumour; which Pin was covered or incrusted, as these hairy Substances, with such calculous Matter, and got there from the Urine in her Bladder, where in all likelihood it had contracted that Crust. I have a silver Bodkin, the broad End of which is covered with a pretty large Stone. A poor Gentlewoman thought, by thrusting this Bodkin up the *Meatus urinarius*, to remove a Stone which pressed upon the Neck of her Bladder, and it slipt past Recovery into her Bladder; whence, after 3 Years, it was taken, and on which, as on a Centre, was bred the Stone. I have other Instances of the same, where an extraneous Body, passed into the Bladder, hath proved as a Centre to attract or have affixed to it such Matter.

As to the Cure, Dilution seems to be the best. The Brewer was cured by drinking plentifully of soft Liquors, which he often poured down; and twice a Week he took the purging Waters. You may guess my Opinion to be, that the less is generated of this Matter, and the less Time it remains in either Kidnies, *Ureters*, or Bladder, the Disease will be mitigated, and, I hope, cured. I believe *Bath-waters* drank warm, Mallow-Tea, Linseed-Tea, Oil of Sweet Almonds, Syrup of Marshmallows, little and often taken, with Baths of emollient Herbs, may be of great Use; and perhaps moderate Exercise may help them off. Opiates, in excessive Pain, are necessary; and now-and-then Bleeding, to take off the Inflammations that must of necessity attend such

such a Distemper. I also think, that some Balsamics, such as *Locatelli's Balsam*, may be useful; and perhaps, with the emollient Method, take off that Disposition in the Kidnies, which produces this uncommon Distemper. The Pains in her Feet, and about her, seem not to have any Relation to this Distemper; and I am of Opinion, that violent Diuretics or Exercise will rather hurt than help her.

3. The hairy Substance, or fine *Capillamenta*, inclosed in the Pill-box, were discharged along with the Urine of a Gentleman during a severe Fit of *Ardor Urinae*; the Gravel that came away was inconsiderable, so that the Cause of the Dysury was chiefly owing to the hairy Substance with the gritty Matter that adheres to it, inflaming, by their Irritations, the *Ureters* and *Sphincter Vesicae*, and Parts adjacent. For, notwithstanding *Phlebotomy*, lenient Clysters, Emulsions, Opiates, and such-like Remedies, were strictly used, all proved ineffectual, till all this extraneous Substance was come away.

These fine *Capillamenta* seem to be the Tegument of an Animal which had got into the *Primæ Viæ*, and passed the *Venæ Lactææ*, and, by Circulation, passed also the *Glandulæ Renales*. For it is more probable, that they were extraneous, than that they were generated in the urinary Passages, in an equivocal Manner.

The greatest Objection that offers to me, is, that it is judged absolutely necessary, that the *Venæ Lactææ* should be smaller than the finest Artery in the Body, that nothing might enter, which might stop Circulation of the Blood. Also,

That the Mouths of the *Lactæals*, which are open into the Cavity of the *Intestines*, (from whence they receive their Chyle) are so small as not to be seen by the best Microscope in dead Bodies.

To obviate these Objections, may not the Mouths of the *Lactæals* be perceptible in living Bodies, when dilated, distended, and turgid with Chyle? And may not these *Capillamenta*, when relaxed with any Humidity, become very flexible, pliable, and susceptible of being contorted, and of assuming any Figure*; and, when thoroughly relaxed, disseminated and floating in a Fluid, enter the *Lactæals*; and consequently may pass through the Convolution of small Arteries, whereof the Glands and secretory Vessels are formed? For a Gland is said to be nothing else but a Convolution of small Arteries.

N. B. This Gentleman has kept a strict Regimen of Diet for many Years, as being subject to frequent Fits of the Gout, an Incontinency of Urine, &c. In the Morning early, a Draught of Cow's Milk, *statim ab Ubere*; which oft doth not pass a *Colatorium*, whereby some of the downy Hair about the Udder might get along with the Milk into the *Primæ Viæ*.

* The *Capillamenta* whilst in the Urinal, and till the Urine was decanted, appeared only like a gross turbid Liquor, the Filaments being so diffused.

— by Mr T.
Knight. Ibid.
p. 705. dated
Carnarvon,
Feb. 20, 1737.

A Remark, by
C. Mortimer,
M. D. &c.
Ibid. p. 707.

Account of a
large Glandu-
lar Tumour in
the Pelvis; and
of the pernicious
Effects
of crude Mer-
cury given in-
wardly to the
Patient, by
Andrew Cant-
well, M. D.
Monspel, da-
ted at Mont-
pellier, June
23. 1732.
N. S. No.
446. p. 139.
July, &c.
1737.

4. I doubt of these Substances being *real Hairs*; I imagine they are rather slender grumous Concretions, formed only in the Kidnies by being squeezed out of the excretory Ducts into the *Pelvis*.

XXI. P——r M——n, born in *France*, but settled in *Cadiz*, having been very ill these 2 or 3 Years last past, had lost the Use of his left Leg and Thigh, was subject to frequent Head-achs and Pains in his Bones, but more especially in his Legs: For which, because he had been given to Women, his Physicians in *Cadiz* salivated him twice, sent him to several hot Waters, and gave him all the Remedies they could imagine, but to no purpose; for his Illness increasing, he had from time to time great Difficulty of making Water, and going to Stool. In this Condition he came from *Spain* to *Marseilles*, and from thence was sent to the Waters of *Balleruc*, of which he drank a great Quantity. But as they did not pass, his Physician there ordered him strong Purges, with Clysters of a Decoction of *Tobacco*, and the like. He then began to vomit his Excrements; upon which the Physician to the Marquis of C——'s Regiment in *Spain*, who happened to be there, ordered him half a Pound of crude *Mercury* by the Mouth, which made him suffer the most exquisite Pains; and his Belly swelled, and became as stiff as a Drum. Here Dr *Montagne* was sent for, who soon discovered the Error in the preceding Practice, by feeling a solid Body near the *Rectum*, which obstructing the Passage, hindered the Clyster-pipe from entering far enough into the Gut. After his Departure, the Patient was again ordered Clysters, which were injected with a crooked Pipe, and several Purges; till at the End of eight Days he died, having his Belly bigger, stiffer, and harder than ever. Though I arrived the Day before his Death, I saw him not till after he expired. I sent for the Surgeon of the Village, who with a *Bistouri* (the only anatomical Instrument he had) opened the *Abdomen* by my Directions, which was filled with a whitish Liquor of some Consistence. The *Epiploon* was all dissolved, and swam in this Liquor like so much *Pus*. This Water poured out, I examined the Intestines. The *Colon* was bursten under the Stomach, and in three other Places at it's lower Part; and so was the *Cæcum*; the *Ileum* all inflamed, and in one Part gangrened. The Lips of the Ruptures were plastered with Excrements, all beset with a prodigious Number of Globules of Quicksilver; and when the Intestines were disengaged and taken out, the Quicksilver fell from them in large Drops. The other *Viscera* were in the natural State, except the Liver, which was gangrened. As I was very solicitous about the Tumour, I looked into the *Pelvis*, where I found an Excrecence of a prodigious Size, which filled all it's left Side. I cleared all round the Tumour; whereby I found the urinary Bladder close pent up between the anterior Part of the Tumour and the *Ossa Pubis*, which occasioned the Strangury the Patient had been tormented with: The *Rectum*, which lay upon the Middle of the *Os sacrum*, was also vastly pressed on by the Tumour, which seemed to take it's Rise from the Holes that are in the left

left Side of that Bone. The Surgeon was so unluckily impatient, that while I laid down the Knife, in order to separate the *Ossa pubis* with a Hatchet, he cut out the Tumour. I then examined the *Os sacrum*, which was so very soft, that my Fingers entered it every where on the left Side. The Tumour is of an ovoïde Figure, covered over with several Membranes: It's Weight is $\frac{1}{2}$ lbs; it's longest Axis is 5 Inches and somewhat more than $\frac{1}{4}$ French Measure; it's shortest $4\frac{1}{4}$ Inches. At first Sight I took it for a *Parenchyma*, but, upon Dissection, found it analogous to the Liver in Substance, Colour, and Consistence. It's Artery, Vein, and Nerve are very big, and are distributed through it's whole Substance: Wherefore I really take it to be one of the conglobate Glands of the *Pelvis*, whose Vessels yielding to the Blood impelled thither with greater Force and in larger Quantity than usual, on account of the violent Exercises of Dancing, Jumping, &c. which the Patient very much practised, gave room to it's Increase to that enormous Size. Upon opening, I remarked three very apparent Divisions in it: And where the *Psoas* lay over it, and one of the *Pyramidales* beat upon it, it was ossified. I preserve it in Brandy, and find that the small Vessels, that were most filled with Blood, press it out into the Interstices of the neighbouring ones.

The Weight the Patient constantly complained of at his left Hip; the Difficulty he had in going to Stool, and that of thrusting a Syringe far enough into the *Rectum* to give him a Clyster with any Success; the Tumour itself, which was easily felt upon putting the Finger into the *Anus*; together with the Palsy of the left Leg and Thigh, might, I think, have given other Indications to the Physicians, than those they took. And the Frictions and other heating Medicines the Patient was plied with, contributed to augment his Illness. In fine, the crude *Mercury* he swallowed, the vast Quantity of *Balleruc* Water he drank before it, with the strong Cathartics taken by the Mouth and *Anus*, seem to have cut him short of some Months, which he might have lived, had he used no other Remedies than a slender relaxing Diet.

XXII. I was called to the Assistance of a Woman in Travail. The Fœtus presented in a transverse Position; I soon recovered the Feet, and in a few Minutes delivered the Woman. The *Funiculus Umbilicalis* was so short, that it was with Difficulty I could make a Ligature upon it, in order to make a Separation: I immediately extracted the Secundine, and measured the *Funiculus*, which was little more than 4 Inches long. As soon as the Woman was taken care of, I examined the Child, which I found to be imperfect in several Parts, there being no *Anus*, neither Privities to distinguish of what Sex it was: Where the *Vulva* should be, there was a small Perforation, (though no Appearance of *Labia*) thro' which the Urine always passed away; there was likewise a large *Hernia Umbilicalis*, and a little lower in the *Linea alba*, was a Perforation, in to which the *Intestinum rectum* opened, and there the Excrements passed during the time the Child lived, which was almost 10 Weeks. Several

An Account of
a Pin taken
out of the Blad-
der of a Child,
by Mr Willi-
am Gregory,
Surgeon. No.
450. p. 367.
Oct. &c.
1738. dated
Brompton near
Chatham,
Jan. 4,
1733-4.

veral Days before the Child died, a Gangrene appeared on the *Hernia*, which soon passed into the Intestines, and occasioned the Child's Death: The *Hernia*, in my Opinion, was occasioned by the Shortness of the *Funiculus*, which did not grow in Length proportionable to the Foetus; the Child in all other Parts was perfect. When the Child died, I had Liberty from the Parents to inspect into it: I did not go through a regular Dissection; I only inspected into the *Intestinum rectum*, (which I found as above described) and the urinary Bladder, which I found very small, and no Urine in it; the Child was never observed to make Water in a Stream whilst it lived, which makes me of Opinion, the *Sphincter Vesicae* was imperfect. In handling the Bladder, I found something sharp pointing to my Finger; I could not discover what it was, until I snipped off the Neck of the Bladder: I then took out of the Bladder a tough kind of Substance, about as big as a small Fig, in which was a Pin with the Head on, and very black; the urinary Bladder, Pin, and viscid Substance, (though now somewhat wasted) are here preserved in *Sp. Vin. R.*

The Figure of
of the Canal of
the Urethra
determined by
solid Injections,
by M. le Cat,
M.D. F.R.S.
Surgeon to the
Hôtel-Dieu at
Rouen. No.
460. p. 684.
Apr. &c.
1741.
Fig. 111.

XXIII. I melted Resin with Wax, and injected this Liquid thro' the Urethra. I filled the Bladder but half way with it, in order to preserve all the Wrinkles of the Canal. When the Injection was cold and solid, I cut thro' the *Ossa innominata*, and dissected the left Side of the Canal and Bladder.

Fig. 111. A. The Glans. B. An Elbow, which the Ligamentum suspensorium causes the Penis to make. C. Folds, or Wrinkles, of the Bulb or of the Gulf of the Urethra. D. The Entry or Streights of the Prostate. E. The Gulf of the Prostate, or the Verumontanum. F. Elbow, or Streights of the Entry into the Bladder. G. A Section of a Portion of the Bladder. H. A Section of the Pubis. I. The Root of the left Corpus cavernosum cut through.

I injected another Subject with very thick Glue. I entirely filled the Bladder therewith through the Canal of the Urethra, until it was somewhat stretched. I let this Injection remain to the next Day, and then found it solid and elastic. I cut the Parts round it, as I had done in the preceding Subject; and afterwards I made an exact Division of the Injection: I put one half of it on Paper, in order to have it's Shape exactly; I have added in pricked Lines, a pretty exact Section of the adjacent Parts.

Fig. 112.

Fig. 112. A. A Section of the Bladder. B. A Section of the Pubis. C. The Cavity of the Abdomen. D. The Peritonæum. E. The Integuments of the Abdomen. F. The Space between the Pubis and the Peritonæum, taken up by the cellular Membrane. It is the Place of the Incision in the high Operation of Lithotomy. G. The Rectum. H. The Glans. I. The Corpus cavernosum. K. The Urethra. L. The Elbow of the Ligamentum suspensorium. M. The Bulb or Gulf of the Urethra. N. The Streights and Elbow at the Entry of the Gulf of the Prostate. O. The

O. The Gulf of the Prostate. P. P. P. Sort of Elbowes, or blind Cavities, found therein. Q. The Streights of the Entry into the Bladder.

XXIV. In the Middle of February 1735, Jane Dawson, of the Parish of Mansfield in Nottinghamshire, an unmarried Woman, aged 30, received a violent Strain by lifting a Tub of Water, and immediately complained of great Pain in her left Side. In March following, she found a Lump, or little round Swelling, in that Side of her Belly; and soon after the whole Abdomen swelled, but more in the left than in the right Side. She complained frequently of severe Pains in her Bowels, which, in Time, became so violent, that she had neither Ease nor Sleep, but by taking large Quantities of Opium. During her Illness she made very little Urine, and was so costive, that she had seldom any Stools but by the Help of Purges or Clysters: The former gave her always Pain, and the greatest Relief she found, was from emollient Clysters that emptied the Intestines. Her Thighs and Legs were not swelled, but these and other Parts of the Body were much emaciated. In this unhappy Condition the poor Woman lived about 2 Years, 9 Months, and died Nov. 17, 1738.

A large Quantity of Matter or Water contained in Cystis's or Bags adhering to the Peritonæum, and not communicating with the Cavity of the Abdomen, by Dr Walter Graham, Physician at Mansfield. Ibid. p. 708.

I should have mentioned, that, before this Accident of the Strain, she had always enjoyed a tolerable good Share of Health; and seldom made any Complaint, but of missing her Menstrua.

Upon viewing the naked Body, the Abdomen was vastly distended, and most at the Navel: The Swelling was unequal, the left Side being more swelled than the right; and there appeared a very distinct Protuberance all along the left Epigastrium: This Protuberance was much softer than the other Parts of the Belly, which were so hard, that upon Pressure they did not pit.

Upon opening the Body, we observed as follows:

The Membrana adiposa was very thin, and the Abdominal Muscles were much extenuated by the great Distention, as is usual in like Cases.

The Peritonæum, which was the chief Seat of the Distemper, and the principal Part to be taken notice of, was grown to so monstrous a Thickness, that its Section at the Navel was $5\frac{2}{10}$ Inches; and it was of the same Thickness below, but somewhat thinner above it. All over the Peritonæum, and throughout the whole, there appeared a prodigious Number of Glands; and the Space between one Gland and another was filled with a white spongy Flesh. Some of these Glands were round, others oblong: Many of them were as large as a Goose's Egg, others about the Bigness of a Pigeon's Egg, and some less; the largest were on the left Side. Their internal Substance was destroyed, and only the external Membranes left, whose Cavities were full of Liquors of different Colours and Consistence: Some contained a thin whitish Humour, others a pellucid viscous Gelly, like the White of an Egg, and some a white thick Matter, like Pus. As the Contents of these Glands thus differed, so did their Membranes; some were very thin, others thicker, and many of them were become cartilaginous. In general, those whose

An Observation of Hydatides voided per Vaginam.

Membranes were thin, contained a thin whitish Liquor; and those that were *cartilaginous*, a thick white Matter like *Pus*. Their internal Surface was quite smooth, and none of their Cavities had any Communication with each other; nor could the Matter be pressed out, without opening them with a Knife.

The Protuberance on the left *Epigastrium* was occasioned by a Quantity of Liquor lodged in a Cavity formed by the *Peritoneum*, which in this Place was about $\frac{2}{10}$ of an Inch thick: This Cavity extended itself over the Kidney and Spleen, and there was found in it above 2 Quarts of thin Liquor of a darkish Colour. The whole Quantity of Matter taken out of the fore-mentioned Cavity, and those of the *Glands* which were opened, was about four Gallons.

In the Cavity of the *Abdomen* there was found no Matter, or Water. The *Omentum* was very white, and much decayed.

The Coats of the Stomach and *Intestines* were very thin and tender, and inflamed in several Places. The *Intestines* lay in the right Side, and were filled with hard Excrements, forced into that Situation by the large Protuberance on the left.

The Liver was very large, of a Colour more red than common, and full of Blood, which upon the smallest Incision flowed freely out of it; and the greatest Part of the Blood in the whole Body seemed to be accumulated in this *Viscus*, and was of a darker red Colour than usual.

The Gall-Bladder was not bigger than natural, nor did it contain any Stones, or concreted Matter; and upon gentle Pressure, the Bile moved easily through the *Ductus Cysticus*.

The *Pancreas* was smaller than common, and adhered closely to the *Duodenum*.

The Kidnies were a little inflamed, and of a flatter Figure than usual; occasioned, as I suppose, by the Pressure of the *Peritoneum*.

The Cavity of the *Thorax* was greatly lessened by the *Diaphragma's* being pressed upwards, by which the Lungs were likewise much compressed, and they adhered in several Places to the *Pleura* and *Mediastinum*. The Heart was of a paler Colour than common: From the Middle to it's *Apex*, it was pressed flat, and there was little or no Water to be found in the *Pericardium*.

An Observation of Hydatides voided per Vaginam, by Mr Will. Watson, F. R. S. Ibid. P. 711.

XXV. A Gentlewoman aged about 48, the Mother of many Children, after a Respite of 6 Years, had, in Nov. 1739, the Symptoms of Conception, which left her in February; from which time to, the End of March, she every Night discharged *per Vaginam Uteri* a considerable Quantity of Blood; and, not perceiving an Increase in her Belly, nor (which in Cases of Conception is the *Pathognomonic* Sign of something preternatural) her Breasts, she concluded her *Menses* were leaving her at their usual Period. But upon the first of April, being taken with great Pains in her Back, and having other Symptoms antecedent to Delivery, there came away, at short Intervals, a very large Number of *Hydatides*, of all the intermediate Sizes, from a Nutmeg to a Pin's

a Pin's-head, some filled with clear, others with bloody *Lymph*; all of them propagated in the manner of a Cluster of Grapes from a spongy Substance, answering the Purposes of a *Placenta*. After the Discharge of these, in a few Days she recovered her accustomed Health.

Upon boiling some of these *Hydatides*, they appeared like the *Ovary* of a boiled *Hen*, with this Difference; in the *Hen*, the Contents of the *Ova* concrete: in this Case, not; but the Transparency was changed to the Colour of Bile diluted with Water.

XXVI. September 21, 1739, a Woman died in our *Hôtel-Dieu*, at *Rouen*, who had an *Abscess* in the right *Hypochondrium*, through which she discharged *Hydatides*; with a considerable Tumour at the left *Hypochondrium*.

Her Body was opened. The *Abscess* of the right *Hypochondrium* was between the common and proper *Membrane* of the Liver. The Tumour on the left Side was almost as thick as one's Head, and twice as long. It was between the common and proper *Membrane* of the Spleen. It ran between the floating Parts of the *Abdomen*, had displaced them, and went so far as to push against the Integuments of the Belly, in it's Passage adhering to the Stomach.

I laid this Tumour open, and found it filled with *Hydatides* of all Sizes, with clear Water, and mucilaginous *Membranes*, which were the Remains of large *Hydatides*, that were bursten by the Motions of the Patient. I examined with Care both the *Hydatides*, and their Bag: The *Hydatides* were composed of 2 mucilaginous transparent, and yet very elastic, *Membranes*. The inward *Membrane* had on it's concave Surface a sort of Villofity wrinkled and mamillated, that pretty much resembled the Surface of a rough Skin, or what is called a *Goose's Skin*. The softest and most gelatinous of these *Membranes* were very like the vitreous Humour of the Eye. The Water contained in all these *Hydatides* was entirely like the aqueous Humour of the Eyes.

There were Clusters of these *Hydatides* quite resembling the *Ovary* of a *Hen*, or a Bunch of *Grapes*, which were made up of Globules of all Sizes.

The Bag that contained these *Hydatides* was pretty smooth on the Side opposite to the Spleen; that is to say, that Part of the Bag formed by the common *Membrane* of the Spleen, or by the *Peritonæum*, was pretty smooth; but on the Side next the Spleen, the Bottom of the Bag was very thick, and composed of several *Lamellæ* half destroyed, which fell off in Bits or Scales, and in Slime, at the least Touch.

It appeared plainly upon the Inspection of these Remains of the Bottom of the Bag, that that was the Source of the *Hydatides*; and, upon considering what Sort of Parts are found on the Surface of the *Viscera*, under their Integuments, it seems evident to me, that these lymphatic Globules were nothing else but the glandulous and lymphatic Grains of the Surface of the Spleen, dilated into Excrescences by the Disease,

An Observation on Hydatides, with Conjectures on their Formation, by M. Le Cat, translated from the French, by T. S. M. D. F. R. S. Ibid. P. 712.

What Hydatides are.

ease, and puffed up by the Lymph, which the Distemper caused to accumulate therein. And thus I conceive this Effect to be produced.

Proofs.

I have proved in my *Physiology*, which is actually in the Press, that these glandulous Grains are nothing but the Ends of the Nerves, or nervous *Papillæ*, which receive the Ends of the lymphatic Vessels into their spongy Texture: And I have, among others, instanced in the *Papillæ* of the Tongue, called *glandulous Papillæ*, which are at the same time the Organ of Taste *, and the Receptacle of the salival Lymph.

A Part of the Nerves, which are distributed into the Substance of the Liver and Spleen, terminate in the Surface of those *Viscera*, under the Form of glandulous or pulpous Grains. This same Surface is the Seat of a great Number of *lymphatic Vessels*: And it is not to be doubted but those glandulous Grains are as necessary for those *Lymphatics*, as the *parotid Gland* is necessary for the Lymph of the *salival Duct*, and the *glandulous Papillæ* of the Tongue for the Liquor that distils from them. In Quality of *Glands*, they are the Receptacle of those Liquors: As *nervous Papillæ*, they furnish the Spirits necessary for the Functions of those Liquors.

As long as the *glandulous Papillæ* are sound, their excretory Pores pour forth the Lymph according as their Cavities receive it from the *Lymphatics*: But if these Pores happen to be obstructed by a Disease; if the Surface of these Grains is altered by an Erosion; or if the natural Tone of these Solids is perverted; the Lymph brought into these Grains will be retained therein: It will stretch these Globules; their Substance having lost it's Elasticity, will easily give way; the nutritious Juice, which they will not be able to drive farther, will be there assimilated, and will contribute to the Dilatation. In fine, a Vesicle will be formed filled with Lymph, or an *Hydatide*, such as those we have examined.

This Congestion of Lymph, or *Hydatides*, will not fail to soften, relax, and raise up the Membrane that covers them; and thus a Bag will be formed like that which we found.

When an *Hydatide* swells to a considerable Size, the Volume of the Fluid will become disproportioned to the Force of the Teguments; these will be burst by the shaking of the contained Fluid, upon the least Motion of the Body. This Fluid will extravasate into the common Bag, upon opening which the Waters and Membranes, which result from that Rupture, will be found.

Most Part of the glandulous Grains are distributed into Clusters, as is well known to Anatomists; wherefore *Hydatides* will also be found disposed in Clusters, like *Ovaries*.

Yet the greatest Number of this Heap will be composed of separate *Hydatides*; because, when one of these Globules has acquired a certain Bulk, it will generally break the too feeble Pedicle, which held it attached to the Cluster; and thus it will fall into the common Cavity.

* See his *Traité des Sens*, Rouen, 1742. 8vo.

This kind of Eruption, or general Disengagement from the Surface of the Bowel, must destroy it's natural Texture, and reduce it exactly to the State in which we found the Bottom of the Bag of *Hydatides*, that were the Subject of this Observation.

XXVII. E—— S——, aged 57, died in St James's Market, Jan. 1725. In examining the *Pelvis* of this Woman, I found a large Bony-Substance, which was contained in the Womb, and so strictly united to it, that they seemed to be one and the same Body. Upon cutting the Substance asunder, I observed, that the *Ossification* went no farther than the Thickness of a Shilling; the Part immediately under the *Ossification* is like firm Flesh, and this Flesh grows softer and softer as it draws near to it's Center.

The Woman never had but one Child, of which she was delivered about 27 Years before she died: Her chief Complaints, for some Years, were a short Cough, great Difficulty in Breathing, frequent Uneasiness in making Water, or in going to Stool, and a constant Weight, or Bearing-down, upon the Parts of Generation.

The immediate Cause of her Death was, undoubtedly, an *Asthma*; for she had only one *Lobe* of the *Lungs* left that was perfectly sound; the rest adhered firmly to the *Pleura*, were very much contracted, and in some Places scirrhus.

A. The Bony-Substance. B. The Substance of the Womb cut open, and turned backwards. C. Small *Fibres* connecting the Bony-Substance with the Womb. D. The right *Fallopian Tube* lying upon the Membrane, which joins the Tube to the Womb and to the Ovarium. E. The Ovarium. F. The *Morsus Diaboli*. G. The left *Fallopian Tube* cut off. H. The Neck of the Womb cut open as elongated by the Disease. I. The Mouth of the Womb laid open. K. The greatest Part of the *Vagina* likewise laid open.

This Womb, with the Bone adhering to it, having been kept 10 Years in Spirits before it was sent to the Engraver, the *Vagina*, *Fallopian Tube*, the Membrane on which the Tube lies, and the Ovarium, must be supposed to be greatly contracted; but that Part of the Womb distended by the Substance, is indeed very little contracted; for it was scarce so thick as a Half-Crown Piece, when it was first taken out of the Body.

XXVIII. This poor Woman, about 9 Years since, was with Child, and, at the Expiration of the usual Time, was attempted to be delivered. The Child was so far advanced in the Passage, that the Midwife declared, that in less than 2 Minutes the Child would be in the World; but, on the Woman's suddenly turning herself, the Child slipped from the Midwife, and could not be found by her again.

Previous to her being pregnant, she had been afflicted with the Venereal Disease, and had had a violent Discharge of a fetid Matter from the Uterus, and was then under the Care of Mr Balgay, Surgeon, who favoured me with being present when he opened the Body. She had been salivated once or twice in our Hospitals, but to no purpose. After

An Account of a large Bony-Substance found in the Womb, which was shewn to the Royal Society, May 17, 1733. by Edw. Hody, M. D. F. R. S. No. 440. p. 189.

Explication of Fig. 113.

Of a Woman who had a Foetus in her Abdomen for 9 Years, opened May 6th, 1739, by Wm. Bromfeild, Surgeon. No. 460. p. 697.

the Time of attempting to deliver her, to the Hour of her Death, she had prodigious Discharges of a fetid Gleet, and frequently indigested Matter with Blood from the *Uterus*. There appeared a Tumour on the right Side, which was moveable to the other, though it's Attachment was chiefly to the right. She was troubled with a Suppression of Urine, ever since the Attempt of Delivery, and within this Twelvemonth went to Stool in a Cloth insensibly, and what *Fæces* descended into the *Rectum*, were immediately discharged. She gradually wasted from a hale lusty Woman, till she was reduced to a mere Skeleton. This Account is the best I could collect from the good Women who were present at the opening of the Body, and most of them at the Time of her expected Delivery, and have been very conversant with her ever since.

Upon opening the Body, the *Omentum* was entirely wasted: The *Peritonæum* was greatly inflamed, and adhered to the subjacent Tumour, which I expected (not being acquainted with the Case) to be a Tumour of the same kind I had lately seen, which was chalky; but, upon cutting into it, there appeared the *Os Frontis*, and, on proceeding farther, the Arm, Leg, and Ribs, on the left Side, with some viscid Matter in the Interstices. It was seemingly contained in a thick membranous Cyst, which, upon Dissection, proved to be the containing *Membranes* of the *Fœtus*, contracted to the Shape of the *Fœtus* in *Utero*, and gave the Tumour an oval Form. The Situation of the *Fœtus* was in the concave Part of the right *Ilium*, and by it's Cyst was attached to the *Intestines*, *Colon*, and *Cæcum*. It had some Vessels that ran on the Surface of the Cyst, that were sent from the internal *Iliacs* of the contrary Side. By it's Pressure on the right *Ureter*, it had hindered the Descent of the Urine, and had greatly enlarged both the *Ureter* and *Pelvis* (of the right Kidney) which was greatly distended with Urine, so that what descended into the Bladder, must steal in *guttatim*.

The *Uterus* and *Fallopian Tubes* appeared of their usual Size, only inflamed. The *Fimbriæ* were loose and fluctuating. On examining farther into the *Pelvis*, there was near six Ounces of fetid Matter lying between the *Rectum* and *Uterus*, which near it's Neck was perforated, and the Parts were very rotten. From it's Neck almost to the Extremity of the *Vagina*, the Muscles of the *Anus* were nearly destroyed. There were some few indurated little Tumours adhering loosely to the Cyst of the *Fœtus*. There were several little Parts appeared like carious Bones found in the Matter contained in the *Pelvis*.

From what has been said, it appears that the *Fœtus* had been 9 Years in the *Abdomen*.

Fig. 112.

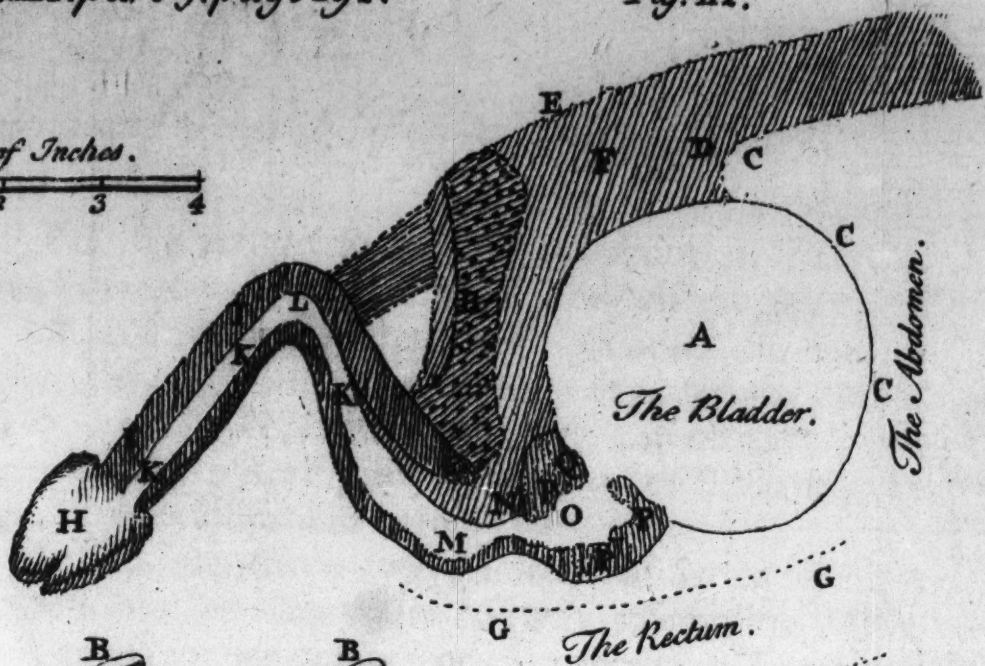
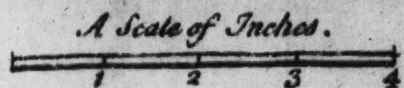


Fig. 113.

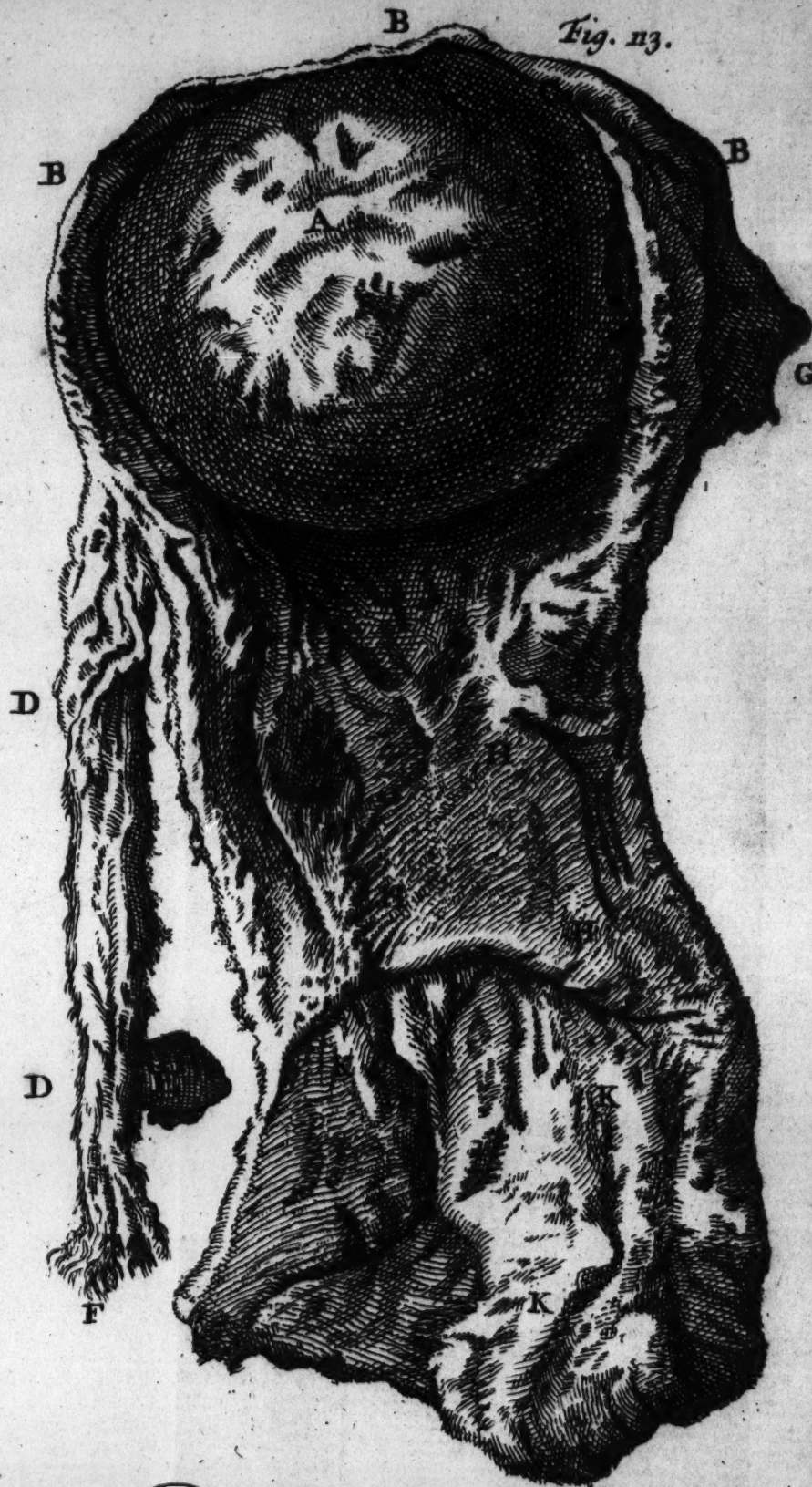


Fig. 111.

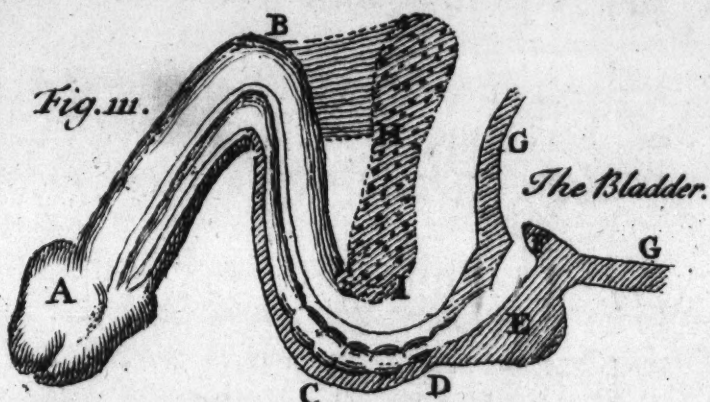


Fig. 109.

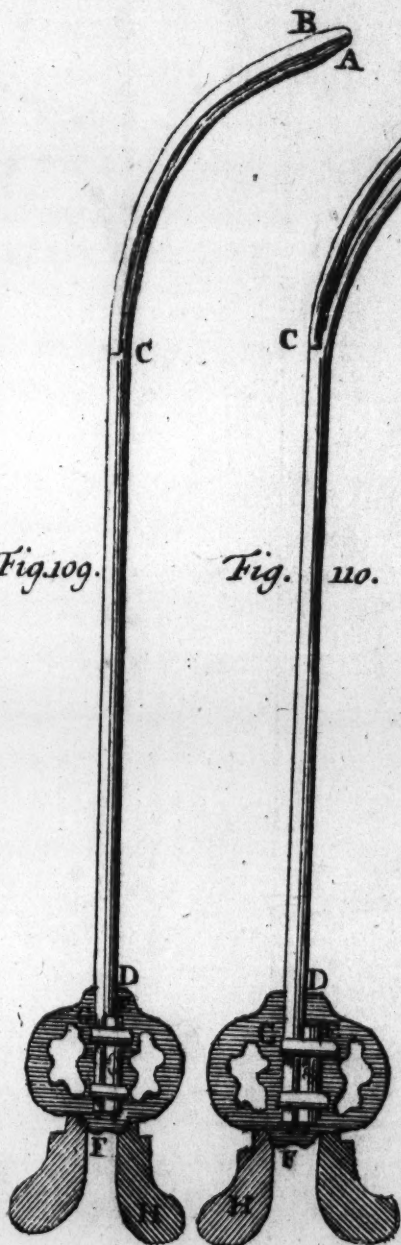


Fig. 110.

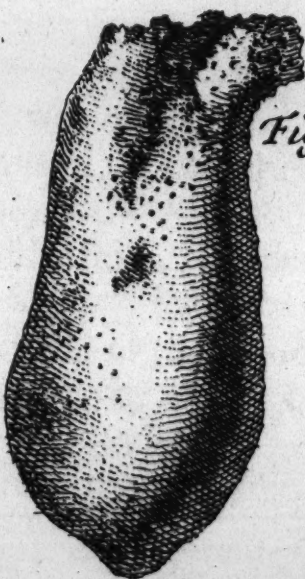


Fig. 108.

A Bony Substance found in the Womb of a Woman Aged 57 Years.

C H A P. V.

The Humours and General Affections of the Body.

I. JOHN WICKS, Carver, in Bromley-street, about 40 Years of Age, had been ill about 3 Weeks by a Loss of Appetite and Indigestion, and at last a Pain and Distention of his Stomach, with a low Degree of an inflammatory Fever; his Tongue dry, rough, and of a rusty brown Colour in the Middle, with a white soft List on each Side; his Urine very high coloured, with a slimy pink-coloured Settlement in great Quantity; Stools very yellow and loose.

Eight Ounces of Blood being taken away, instead of Serum nothing appeared above the Coagulum but this white Liquor, resembling Milk, which I poured off to the Quantity of $\frac{3}{4}$ iv, or thereabouts. There was no Smell perceptible at first, but in 6 Days it began to have the Smell of rotten Eggs: It stood in a Room, where there was a Fire for some Hours of the Day, for 3 Weeks more, in which time it did not alter it's Consistence nor Smell.

He had eat very little for a Week before I first saw him; and only a little of a Calf's Foot stewed the Night before for Supper, and no Breakfast that Day. He was addicted to drinking of strong Pale-Malt Liquor every Day in his Health.

If this be Chyle, it is a Substance very different from Milk, which is apt to turn sour and thick by keeping, and never contracts the putrid Smell of rotten Eggs, as this did. Whether it be not Chyle turned putrid, and near to Purulency, by a long Circulation in the Blood-Vessels, but not converted into Blood, through some Defect in the Sanguification, is a Question which I doubt cannot be decided without more Observations and Experience.

The Coagulum of the Blood was covered with a fizy Pellicle, about the Thickness of a Shilling. The red Part was of a grumous, tender, incoherent Consistence.

Though he was much better in a Week's time, I ordered 5 Ounces of Blood to be taken away, to see what Change had been made, and found the Coagulum covered with a fizy Pellicle to the Thickness of Half a Crown, the red Part of a due Consistence, the Serum clear, without any Chyle.

The Urine became clear, and he recovered in about two Weeks after I saw him first.

II. In Jan. 1729, Daniel Goddard, a Gardener, about the Age of 24, at Wisbech in the Isle of Ely, Cambridgeshire, had a slight Puncture from a rusty Nail in the Sole of his right Foot. And, notwithstanding there was not wounded any Tendon, or Blood-vessel, larger than small Branches of Veins, the whole Foot was immediately swollen to a very

An Observation of a white Liquor resembling Milk, which appeared instead of Serum separated from the Blood after it had stood some time, by Alex. Stuart, M. D. F. R. S. &c. No. 442. p. 289. July, &c. 1736.

An extraordinary Hæmorrhage, by Hen. Banyer, M. D. No. 471. p. 628. Read Dec. 22. 1743.

unusual Degree, without a Fever, or other apparent Cause for it. It was also attended with great Pain, and an extraordinary Pulsation upon the Part, as in Wounds of Arteries; and so distended as if the Blood would burst out of it's Vessels.

Accordingly, after 2 Days, upon opening a superficial Sinus, to enlarge the Wound, there rushed out immediately such an obstinate Flux of Blood, as would not yield to any styptic Means, longer than the Bandage was holden on by some strong Hand. And, although, by this Incision, no Vessels were wounded, but Capillary Veins; yet this Hemorrhage continued to shew itself as violent as at first, for 6 Days successively, whenever the necessary Means were relaxed. Upon which, for the sake of *Revulsion*, the Patient had a Vein opened on the Arm of the opposite Side; and it had such a sudden and surprising Effect, that the Flux of Blood in the Foot instantly ceased, and the Wound healed very soon without any further Trouble; but the Flux of Blood, consequent upon Venesection, became equally as difficult to restrain, as that in the Foot, for the Space of 4 Days; all which time it would have continued to flow most violently without the strictest Bandage, and the same Care of the Hand, as before. Perhaps the Period of this Hemorrhage might have been much longer, if I had not suffered the Ligature on the Arm to be loosened now-and-then, as I judged the Redundancy of Blood required, for the sake of some Evacuation, at each time. After the Bleeding, he soon recovered his Strength, so as to do his Business in the Gardens; and continued very well till *March* 1730. About the Middle of this Month, he complained of Sleepiness, and a particular Heaviness all over his Body; which was followed, in 3 Days, by a violent Hemorrhage from the *Nose*. This Flux, in spite of all Means being tried, except Venesection, continued 7 Days, and could never be totally stopped, all this time, for one Hour together. He recovered again in a very short time, and was able to work in the Summer-season, without any Complaints, till *Oct.* following. Then the Hemorrhage returned again at the *Nose*, as before, with all the same Circumstances, and in Defiance of all Endeavours, continued the Period of 7 Days. Thus it returned in like manner of Bleeding, by *Stools*, in the Middle of *March* 1731, and continued to discharge this Way great Quantities of Blood, in one Motion, and sometimes two Motions every Day for 7 Days together, in Opposition to the most efficacious Restrictants. Also it made it's regular Return by vast Profusions of Blood from the *Intestines*, in the Beginning of *Oct.* following, to the End of the first Period of 7 Days, without Gripings, or any such uneasy Sensations. Thus, again, it kept as orderly Returns about the Vernal and Autumnal Equinoxes of 1732, 1733, with vast Profusion of Blood by Stool, for the usual Term of 7 Days, agreeing in all Circumstances with the preceding Years. Likewise at, or very near these two grand Seasons, in 1734, 1735, this habitual Hemorrhage broke away by the *Kidnies and urinary Passage*.

Passage; and still constantly, for these 2 Years, kept its old stated Time of 7 Days, without any other Variation.

This young Man was seized in Dec. 1735, with the Small-pox, of the distinct Kind, which produced such a Change in his Constitution, that he escaped those periodical Hemorrhages, or any other spontaneous Evacuations equivalent thereto, for the 2 Seasons of the Year 1736; and remained in very good Health till Christmas following, being above 13 Months free from any Symptoms of his old Eruption. But, upon December the 27th, without any previous Notice of Heaviness and Sleepiness, the Hemorrhage returned by the urinary Passages; but much more favourably, and continued only 3 Days. Again, on May 13, 1737, he felt the previous Warnings, and bled again by Urine to the 20th; with this Difference, that for 3 Days the Urine was only Coffee-coloured, but afterwards, for 4 Days longer, every Discharge resembled an Effusion of Blood from a Vein just opened. He presently recovered his Strength, even although the Air was exceeding warm at this Time; and I saw him 5 Months after, very robust and healthy, and, as he told me himself, was free from all kinds of Tendency towards his old Complaint. But he had always the Appearance of too much Fulness, tho' I am of Opinion, that his Constitution did not suffer so much as might reasonably be imagined, from such prodigious Hemorrhages. Of my own Knowledge, he had no Return of his Bleeding, or any thing like it, the ensuing Autumn; but remained perfectly well all the following Winter. Afterwards I had no Opportunity of making further personal Inquiries, but was informed by an intelligent Man, that in March 1738, this unfortunate Person got a slight Wound again, somewhere upon one of his Legs, which proved equally as difficult, with respect to the Flux of Blood, as the first Puncture in his Foot. And, whether from too strict a Restraint of the Hemorrhage, or for want of Venesection, he fell into very violent Convulsions for 4 or 5 Days, and died in a manner like Suffocation, from too much Redundancy of Blood.

As this Hemorrhage never once depended upon any other Distemper, or observed any regular Concurrence with the Revolutions of the Moon, it appears to be a very extraordinary simple Plethora. During the 4 Years that this Flux of Blood came from the Nose and Intestines, the Urine was never of a higher Colour than Amber; nor was there any Symptom of a Fever by the Pulse, or otherways, for the whole Term of the Disorder.

III. In my short Essay on the Use of the Bile in the Animal Economy*, some Points, which required a farther Illustration, having been there, for the sake of Brevity, only hinted at; it is necessary, and I hope may be of some Use, to set these Points in a clearer Light: Which I shall endeavour to do, by solving such Difficulties, and answering such Remarks, as have occurred in Conversation and Correspondence on that Subject.

* See Vol. VII. Part iii. Chap. vi. §. 5.

Explanation of
an Essay on the
Use of the Bile
in the Animal
Economy, by
Alex. Stuart,
M.D. F.R.S.
&c. No. 427.
p. 5. Jan.
&c. 1733.

The first Remark, which deserves Regard is, that I take no Notice of the Effect of the Gall spilt upon the external Coat of the *Intestines* from the Wound in the *Gall-Bladder*, whose *Stimulus* on the Outside is supposed sufficient to have produced, and to have solved all the *Phænomena*, or Symptoms observed and related in the Case: So that all the Symptoms which I attribute to a Want of the *Stimulus* of the *Gall* on the Inside of the *Intestines*, might have been more properly ascribed to the same *Stimulus*, acting upon the Outside of the uppermost *Guts*, situated nearest to the *Gall-Bladder*, whose compleat Contraction by the Force of that *Stimulus*, expelling the Air out of their Cavity, and forcing it into the inferior *Guts* (as in windy *Cholics*) would have distended them to the Pitch mentioned in that Essay. At the same time it is acknowledged, that had the Gall been carried clean out of the Body by any Vent, so as that no *Stimulus* had remained to act either upon the Inside or the Outside of the *Intestines*, then my Way of accounting for the Symptoms had been good, and the Conclusions just.

I acknowledge that there is some Appearance of Reason for this Remark, and the Objection which it implies; but the whole Strength of the Argument lies in a Supposition that a *Stimulus* on the Outside of the *Intestines*, is capable of exciting a Contraction, supplying the Want of that *Stimulus* on the Inside, and also of causing a preternatural Distension of the whole Canal. The contrary of all which I shall endeavour to prove.

In order to this it is necessary to premise, what perhaps may not have been universally adverted to, yet can be no sooner proposed than acknowledged.

1. That the whole Action of the *Nerves*, whether in Sensation or in Muscular Motion, is exerted at their Extremities only.

2. That the Sides of the *Nerves* every where along their whole Tracts, are entirely insensible, and serve neither for Sensation nor Motion.

The *Apparatus* of Nature towards both these Actions makes this plain. Towards Sensation we see, that the *medullary Substance* of the *Nerves* at their Extremities is divested of it's Coverings, which are Processes of the *Dura* and *Pia Mater*, and ends bare in the Form of small soft *Papillæ*, from their Figure, called by *Anatomists* *Pyramidales*, on the Surface of the *Cutis*, covered over with the *Cuticula*, where they act their Part in Sensation, or Feeling, Tasting, and Smelling. The soft denudated Branches of the *Optic Nerve* which compose the *Retina*, and what for the same Reason is called the *Portio Mollis* of the *Auditory Nerve*, the immediate Instruments of Seeing and Hearing, prove the same.

Again, it is the Extremities of the *Nerves* that enter with their Coverings into the *Muscle*, and into each *Fibre* of the *Muscle* to which they belong; where they deposit their Contents, or act their Part in muscular Motion.

But the Sides of the *Nerves* along their whole Tracts, are insensible or void of Feeling, because their *medullary* Substance, and it's Contents, which are the only immediate Instruments of Sensation in them, are here covered with the *Pia* and *Dura Mater*, the last of which is the strongest, densest, and most impenetrable Membrane of the whole Body, capable of defending and conveying the tender *medullary* Substance of the *Nerves* and it's Contents, safe, unhurt, and undissipated to the several Organs of Sensation and Motion, at their Extremities the Seats of their Action.

A further Confirmation of this from Experience, is the Insensibility of the Side of a large visible Branch of a *Nerve*, which sometimes happens to lie bare and exposed in a Wound or Ulcer, where it will bear the Touch of the Probe without feeling, and occasions no more Pain than in Wounds and Ulcers of the same kind, where the *Nerves* are not exposed, unless the investing Membranes, the *Dura* and *Pia Mater*, be by any Accident wounded, lacerated, or corroded; in which Case, the *medullary* Substance being laid bare, exquisite Pain is felt, and very severe Symptoms ensue, which are hardly to be overcome, or never so easily as by cutting the *Nerve* quite through, so as that the Extremity may retire within the Flesh, and the *medullary* Substance be protected by it.

By which it appears, that the Sides of the *Nerves* are insensible or void of Feeling, and that the Extremity of the *medullary* Substance, either by Nature, or by some Accident, laid bare, is the only immediate Instrument of Sensation.

This being premised, the Structure of the *Intestines*, the Parts in Question in the Case before us, comes to be considered. They are made up of four *Tunics*, or Coats. The first, or external Coat, is a common membranous Covering, borrowed of the *Peritonæum*. The second is composed of their annular, contractile, muscular *Fibres*, the immediate Instruments of their peristaltic Motion. The third is the nervous Coat, a reticular *Plexus* of *Nerves* intermixed with *Blood-Vessels* and *Glands*, placed immediately under the muscular, and over the villous Coat. The fourth is the villous or innermost Coat, on the concave Side, rightly called villous, as it appears viewed through a Microscope; though from it's Appearance to the naked Eye, it be erroneously called the mucous Coat. This is generally allowed to consist of the capillary Extremities, or rather Roots of the *Lacteals*, and the excretory *Ducts* of the *Glands*, which together form these *Villi* that are seen in it. Among these, suitable to Analogy in all other Parts of the Body, the *Papille Pyramidales*, or Extremities of the *Nerves*, are lodged under the *Cuticula* of the nervous Coat, for the Uses of Sensation, so necessary for the Purposes of Nature, in this very sensible Part the Inside of the *Guts*, which is known to be so quickly and necessarily affected by the Qualities of their Contents.

The

The proper Nerves of the first or outward Coat, are those of the *Peritoneum*, of which it is a Part, arising from the *Medulla Spinalis* of the Loins and Os Sacrum: Whereas the Nerves proper to the Guts, are of the *Par Vagus*, and *mesenteric Plexus*: Therefore as there is no Communication of Nerves between this external Coat or Covering, and the proper Substance of the Intestines themselves, a Stimulus acting upon this external Coat only, would not affect the Guts so as to excite any considerable Degree, either of Sensation or Motion in them.

Again the proper Nerves of the Intestines, whose Origin, Disposition, and Situation have been already described, terminate either in the muscular contractile Fibres of the Coat immediately above them, or carry their Extremities to the Inside, where they terminate under the *Cuticula*, for the Use of Sensation; so that a Stimulus on the Outside of the Intestines, besides the Difficulty of passing through the two external Coats, before it could reach the proper Nerves of the Guts, would at last only irritate their Sides, where they are insensible, because covered with the *Dura Mater*: And if it might be supposed, that such a Stimulus as is in Question, to wit, the Gall, could have penetrated through these Coats into the Cavity, where the sensible Extremities of the proper Nerves of the Guts lie exposed to it, yet such a Filtration through all these Coats, as it could not be performed soon, nor in great Quantity, so it would enter at last, divested in a great Measure of it's grosser, saline, oleaginous, and pungent Parts, by the Filtration, and thereby lose the Power of a Stimulus on the Inside; as the Situation of the Parts, and Disposition of the Nerves above described, made it an ineffectual one on the Outside, as much as if it had been carried quite out of the Body.

To conclude; if the Gall spilt on the Outside of the Guts, had been capable of exciting a Contraction in any Part of them, so soon as it came to cover the whole Surface, it must have had the same Effect equally every where, and the whole Canal should have been found contracted to it's smallest Diameter: Whereas it was found every where distended to a great Pitch.

It is therefore plain, that a Stimulus on the Outside of the Intestines, has not the Effect of such a Stimulus on the Inside. It can neither excite them to a Contraction; promote their peristaltic Motion; nor supply the Defect or Want of such a Stimulus on the Inside, much less occasion such an universal Distention, or account for the Symptoms arising from it, which is what I undertook to prove.

It was for these Reasons, and to avoid Prolixity, that the Gall spilt on the Outside of the Intestines, was not taken notice of in that Essay.

The second Difficulty is how a fresh Recruit of Chyle should be a Cause of Sleep.

The Experiments which I made before this Society*, I hope may serve to justify what I shall here assume, concerning the Nature and

* Ibid. §. 7.

Existence of the *nervous Fluid*, or animal Spirits, in the Solution of this second Difficulty.

The Argument which has been offered, runs thus: It is well known, that People after eating plentifully are often inclined to Sleep, long before the *Chyle* can be supposed to be got into the Blood; therefore a fresh Recruit of *Chyle* cannot be the Cause of Sleep; but there must be some other Cause, at least at that time.

Which Cause is assigned by supposing, that after a plentiful Meal the distended Stomach will load and oppress the descending *Aorta*, so as to hinder the *Blood* in it's Descent, and thereby force a greater Quantity than usual into the *Aorta Ascendens*, which by it's distended Branches in the Brain will obstruct the Secretion of the Animal Spirits through the *Glands* of the cortical Substance into the Origin of the *Nerves*, and thereby produce Sleep.

This being generally esteemed a mechanical Account of the Cause of Sleep after Meals, deserves the greater Attention.

In answer to which, if such was the true Cause of Sleep after Meals, it ought to have the same Effect upon the *Cerebellum*, from whence most of the *Nerves*, that serve in the natural and vital Functions arise; and so would hinder these Functions, to wit, Digestion, the peristaltic Motion, Respiration, and the Circulation of the *Blood*, all which, on the contrary, are observed to be more regular and stronger in Sleep, than when we are awake; at least in a healthy and temperate Person, who has used moderate Exercise.

Again, Gluttony, Drunkenness, and Flatulences, which overload the *Stomach*, and therefore, according to this *Hypothesis*, ought to produce the quietest and most serene Repose in Sleep, do, on the contrary, bring Inquietude, or broken and interrupted Rest; and when to the greatest Excess, a lethargic Sleep, which is a Disease for the Time, and sometimes terminates in Death.

The *Incubus* also, which is justly supposed to arise from an Inflation or Distension of the *Stomach*, in a supine Posture in Bed, oppressing the *Aorta Descendens*, ought to produce quiet Rest; whereas nothing disturbs more, as it first brings the Person out of quiet Sleep into a sort of waking Dream, with a Sense of Oppression, and at last awakes him quite, in a kind of Terror, with Palpitation of the Heart.

And indeed as nothing contributes more to sound and quiet Rest than an easy Digestion and Respiration, a sedate, equal, and regular Circulation of the *Blood*; that is, an uninterrupted Function of all the natural and vital Parts; the Reverse of these, and particularly an interrupted or difficult Circulation, if to any considerable Pitch, must produce the contrary Effects, to wit, Restlessness or Inquietude of some kind or Degree; as in Fevers and other Distempers attended with such Irregularities of the *Animal Oeconomy*.

The Difficulty which is suggested about the *Chyle's* not getting soon enough into the *Blood*, by the way of the *Lacteals*, to produce this Effect.

fect in such as sleep immediately after a plentiful Meal, vanisheth when we consider, that this very rarely happens, at least never attends temperate People in perfect Health, and in a temperate Climate; but such as are gross Feeders, Drunkards, Corpulent, Short-necked, by Constitution or Make liable to Apoplexy or Palsy, or have formerly suffered by such Distempers, or live in a hot Country.

In gross Feeders, Drunkards, and such as are corpulent, from these Causes the *Lacteals* are never quite empty; in such the Food of the present Meal, by exciting the peristaltic Motion, will, in a few Minutes, press forward the *Chyle* of the preceding Meal into the *Blood*. In full Vessels or *Tubes* the Reception and Discharge will be instantaneous, or nearly such; because supposing the Apertures to be free or unobstructed, as much precisely will issue at one Extremity of a full Vessel or *Tube*, as is forced into it at the opposite Extremity; and that instantaneously, because of the Contiguity of the *Globules*, or Particles of the *Fluid* it contains.

In short-necked People the Passage between the *Heart* and the *Brain* being proportionally short, the Force or *Momentum* of the Circulation in the *Brain*, is by so much the greater; but a strong and swift Circulation is an Enemy to all Secretions, as is evident in *Fevers*, and mechanically demonstrable; for all the Secretions being by lateral Branches going off at or near to right Angles (which is very remarkable in the *Brain*) a swift Circulation or Motion along or parallel to the Axis, carries along with it what should be laterally secreted. Hence a Paucity of Animal Spirits in short-necked People, who by this Make are liable to Apoplexies, Palsies, Coma's, Lethargies, a Listlessness, Inactivity, and Drowsiness, especially after Meals, when the fresh *Chyle* has got Admission, to absorb a Part of the already few remaining Spirits, which must be recruited in Sleep.

Again in hot Climates, a continual Waste or Dissipation of the Spirits by Heat, makes the Inhabitants generally lazy and unactive: In such the recent *Chyle*, the grossest circulating *Fluid* of the whole Body, will quickly absorb the few remaining Spirits, and dispose them to sleep after every Meal: Except when the Cool of the Evening checks Perspiration and the Evaporation of those Spirits, which were recruited by Sleep in the Day-time, and therefore remain plentiful enough to support their Activity after Supper, when the Business of the meaner, and Diversions of the richer Sort begin; which, in colder Climates, is the Case after Breakfast and Dinner.

For a farther Confirmation of this, Brandy, and the Spirits of fermented Liquors, are known to produce a drowsy Stupidity in such as drink them to any Pitch, and an habitual Dulness in habitual Drinkers of them; and, when drank to Excess, throw the Drunken into a kind of lethargic Sleep for some time. Yet the Quantity taken down, sufficient to produce these Effects, is never so much as to load or distend the *Stomach*, so as to oppress the *Aorta Descendens*, or to hinder the Circulation downwards; and therefore cannot be supposed to produce Sleep

Sleep or Sleepiness in that Manner, but in a different Way, which shall be described in the Sequel of this Discourse.

Thus this Position concerning what has been generally esteemed a mechanical Cause of Sleep after Meals, being, I think, sufficiently refuted, it remains that I endeavour to establish such a general Cause of Sleep, as may be conformable to what is advanced in the Essay under Consideration.

I believe it will hardly be denied, that the Cause of Sleep in general is a Want of a sufficient Quantity of animal Spirits for the Use and Exercise of the animal Functions: Therefore whatever prevents their Recruit; hinders or impedes their Secretion; absorbs or fetters them when produced; and whatever exhausts or evaporates them, by occasioning a Paucity of Spirits, will, in a healthy Person, produce a Listlessness, Laziness, a Tendency to Sleep, or Sleep itself, in Proportion to that Paucity of the remaining Spirits.

If we enumerate all the known remote Causes of Sleep or Sleepiness, we shall find that in some one or other of the Ways above set down, they do all of them tend to produce this immediate or proximate Cause; to wit, an Impairment of the nervous *Fluid*, or animal Spirits, and thereby bring on these several Dispositions to Sleep, or Sleep itself.

All the remote Causes of Sleep, or Sleepiness, I think may be fully comprehended in the four following Particulars, and considered in the following Order.

- I. Exercise.
- II. A too plentiful Meal.
- III. Drunkenness, or a too great Quantity of fermented Liquors, or of their distilled Spirits.
- IV. The whole Tribe of *Narcotics*, or *Soporifics*, of which *Opium*, and its several Preparations, are the chief.

I. Exercise appears to waste all the *Fluids*, and particularly the animal Spirits, the active Instruments of all Motion; so that the Remains are not sufficient for the Exigencies of the natural and vital Functions; and also to supply the Demands of voluntary Motion, and to assist in Sensation, and the Operations of the Mind.

And here it is proper to show how this Waste necessarily brings on Sleep in a healthy Person, and how the natural and vital Motions, and Functions of Digestion, Respiration, and Circulation, notwithstanding this Waste, do necessarily go on in Sleep, leading the Remains of the Spirits to their Assistance, and making the Deficiency fall to the Share of the animal or voluntary Motions and Organs of Sensation.

In order to shew this, let us observe what is very obvious, that when any *Muscle* is brought into Action against our Will by a superior Force, as when a stronger Man bends or extends my Arm contrary to my Will or Inclination, the Benders or Extensers of my Arm swell and contract

in the same manner, and the Afflux of the Blood and Spirits to the contracting Muscles, is the same as when I do it voluntarily: Therefore by any external or adventitious Force, the Blood and Spirits will be derived upon the Part thus forced into Action.

But all the natural and vital Parts have such an external or adventitious Force continually acting upon them. In the *Primæ Viæ* the Weight and other Qualities of our Food and Drink, mixed with Air and Bile, excite the peristaltic Motion, as necessarily as the Weight of a Clock, or Spring of a Watch wound up, keeps the Wheels and Pendulum, &c. in Motion.

The Chyle forced from thence, together with the Blood returning into the Heart, as necessarily set it's elastic Springs at work, and the same Blood and Chyle forced into the Arteries by it, make their Diastole and following Systole unavoidable.

The Air by it's Elasticity, and the whole Weight of the Atmosphere, forceth itself into the elastic Pipes and Vesicles of the Lungs, and dilates them; which by their Elasticity and Mechanism, assisted by various Muscles, and the Ribs and Cartilages of the Thorax, as necessarily repel it in Expiration.

It is therefore evident, that all these natural and vital Parts are acted upon, and set at work by an external adventitious and irresistible Force, continually exciting them whether we will or not, whether awake or asleep; therefore the Blood and remaining Spirits after Labour, will be mechanically and necessarily led to all these Parts that are thus forced into Action at all times, but especially most regularly and copiously in Sleep, when all external Objects cease to solicit our Senses, and the Will does no longer determine the Spirits into the Muscles of voluntary Motion; which two Kind of Actions, as well as the Operations and Passions of our Mind, do, in the Day-time, make strong Derivations of the Spirits from the natural and vital Functions; which, for that Reason, are never so perfect as in sound and undisturbed Sleep.

Those who are acquainted with the Doctrine of Derivations and Revulsions, founded upon innumerable Observations in the *Animal Economy* and Practice of Physick, do know, that a Flux of any of the animal Fluids arising from Nature, or from a Disease, or provoked by Art to any one or more Parts of the Body, or to any Organ of Secretion or Excretion, will cause a sensible proportional Diminution of the Afflux to, and of the Secretion and Excretion by the other Parts and Organs.

Therefore so soon as a Deficiency of animal Spirits happens by Labour, or from any other Cause whatever, that Defect will be first felt in the Organs of Sensation, the Muscles of voluntary Motion, and the Operations of our Mind; because these are not acted upon by such powerful and irresistible Agents, as the Organs of the natural and vital Functions are in perfect Health; for the Mind being sensible of the Defect of Spirits for it's Actions and Operations, chooseth to forbear;
we

we retire from external Objects, and then the Whole of the remaining Spirits are led to the natural and vital Organs, by the Mechanism above described; and the Organs of Sensation and voluntary Motion must be entirely deserted by them for that time; which is the State of Sleep, and which will continue until a greater Quantity of Spirits be recruited, than is consumed in the natural and vital Functions; at which time the Redundancy or Overplus begins again to be secreted into the other deserted *Nerves*, to wit, into those of Sensation and voluntary Motion; which, flowing now copiously into the relaxed *Muscles*, excites Stretching, Yawning, &c. and at last rouseth out of Sleep.

II. A too plentiful Meal is known to cause a Heaviness, Inactivity, Lethargy, an Aversion to Motion or Action, a Drowsiness, Sleepiness, and in some Sleep itself, soon after eating.

It has been proved above, that this cannot proceed from a Distension of the *Stomach*; I have also endeavoured to prove, that in such the *Lacteals* are never empty, and that the *Chyle* of the preceding Meal is forced through them into the *Blood* by the succeeding, almost instantaneously, or so soon as the peristaltic Motion is excited or increased by the Food taken down, which must be during the time of such a Meal, or very soon after, according to the Degree of Fullness of the *Lacteals* before that Meal. What Change then can we imagine to have happened to the Body in this time of a Meal so remarkable, and so likely to affect the *Oeconomy*, as that of the Admission of a *Fluid* into the *Blood*, much grosser and less fluid than itself? Such a Mixture must render the whole Mass grosser, or of a thicker Consistence than before, as it quickly mixeth with the finer, and absorbs it's most fluid Parts; but it will hardly be denied, that if there is such a *Fluid* as animal Spirits, they must be the finest and most depurated *Fluid* of the *Blood*: These therefore will be absorbed, and mixed with this grosser crude *Fluid* the *Chyle*, and therefore will be diminished by it; and being thus intangled, will be more difficultly secreted, and in less Quantity: Hence that Paucity of Spirits, which will dispose to sleep in the manner above described, in speaking of a Paucity of Spirits after Labour or Exercise.

III. How far strong fermented vegetable Juices or Liquors, and their distilled Spirits drank to any Pitch of Excess, do bring on Sleep, or some Degrees of it, has already been said.

The distilled Spirits of fermented Liquors, are known to lessen all the Secretions and Excretions, and therefore are of use in *Diarrhæas*, in excessive and colliquative Sweatings; and I have known *French Brandy*, taken incautiously, to have put a Stop to a Sweat procured by *Sudorifics*. In habitual Drinkers of them, they gradually lessen the Secretion of the *Bile*, and insensible Perspiration, and thereby bring them at last into the Jaundice and Dropsy.

Spirituous Liquors, and particularly *French Brandy* in the most remarkable Manner, being mixed with the *Blood* as it flows from a Vein

into a Porringer, unites the serous with the globular red Part of the *Blood*, to such a Degree, as that no *Serum* separates from it in many Hours, and in some not at all; an Experiment which may be easily made; which shews in what manner it hinders the Secretions in the Body, these being all of them of the serous Kind: Hence that great Impurity of the *Blood* arising from a Restraint of the Secretions in such People; and also that Paucity of Spirits, the general Cause of Sleep and Dulness, very different from the Alacrity and Vivacity of the Temperate, and even of Water-drinkers.

That therefore which fetters or binds up all the *Serosities*, or most fluid Parts of the *Blood*, and proves a strong *Copula* between them and the red *Globules* thereof, may be reasonably supposed to fetter or tie up the finest *Fluid* of all, to wit, the animal Spirits with the rest, and in the same manner to hinder their Secretion, and thereby produce Sleep, or some such Degree of it as is above-mentioned.

IV. As to *Opium*, and all the Class of *Soporifics*, if we compare the visible Effects of them with what has been said above of *Brandy*, or Spirits of fermented Liquors, we shall find them much the same. *Opium* is known to lessen or suppress all the Secretions and Excretions, and is therefore of such remarkable Use in *Fluxes*, *Rheums*, *Catarrhs*, &c. it has indeed been conceived to be a *Sudorific*, but that only in Composition with *Aromatics*, as in *Venice* or *London Treacle*; or with *saline* Bodies, as the *Sapo Tartareus* in the *Pil. Matthæi* or *Starkii*; and that too assisted by plentiful Dilution with warm Sack-Whey, or such like Liquors, and the Addition of volatile Spirits of *Hart's-Horn*, &c. which are known to thin the *Blood*, as Mr *Leewenboeck's* Microscopical Observations, and the mixing of these volatile saline Spirits with *Blood*, as it runs out of the Vein into a Porringer, do sufficiently evince. Which shews, that these volatile Salts are good Correctors of *Opium*, as they break down and colligate the *Blood*, and therefore tend to promote the serous Secretions, which *Opium* by itself, and all distilled Spirits of fermented Liquors do retain, or restrain for some time, incorporating the *Serosities* with the red *Globules* of the *Blood*, as has been observed before.

In hot Countries, where large Doses of *Opium* are taken, the Effects are nearly the same with what we observe in Drinkers of distilled Spirits of fermented Liquors; to wit, a small Dose exhilarates, a greater brings on some Degree of Drunkenness, or temporary Madness; this increased will lay to sleep, and a very great Dose will kill.

In this Comparison therefore, may we not justly conclude a Parity in the Causes, from the Similitude of the Effects; though all the secondary Qualities of such Causes, which offer themselves outwardly to our Senses, be apparently very different; thus Gunpowder is as much a latent Fire as Brandy, and will exert itself in that Shape to a far greater Degree than it, in equal Circumstances, that is by the least Contact of Fire; therefore, I say, that though *Brandy* and *Opium* shew no outward

ward Resemblance to our Senses in Smell, Taste, Colour, Consistence, and such like secondary Qualities, no more than *Brandy* and *Gunpowder*; yet if in proper and equal Circumstances, that is, in Contact and Mixture with the *Blood*, they produce the same, or nearly the same Effects, we may justly conclude, that there is a latent Similitude of primary Qualities in their Natures, which they make manifest in proper and equal Circumstances, in producing the same or parallel Effects.

But it has been shewn above, how, and in what manner *Brandy* fetters and intangles the animal Spirits, and other *Fluids* of the *Blood*, uniting them too intimately with the grosser Parts, and thereby hindering their due Secretion for some time; whence a Paucity of Spirits, which discovers itself by an Inequality and Irregularity of their Distribution in Drunkenness; a still greater Defect in Dulness and Drowsiness; yet more in Sleep, and a total Suppression of their Secretion, as well to the natural and vital as to the animal Organs, which is Death, the Effect of the greatest Doses either of such distilled Spirits or of *Opium*.

From what has been said on this Subject, it seems as plain as the Nature of such a physical Demonstration will admit of.

I. That the universal Cause of Sleep is a Paucity of animal Spirits.

II. That this Defect will arise from whatever exhausts, wastes, or evaporates them when produced, as Labour or Exercise; or from whatever absorbs them, as a great Quantity of crude *Chyle*, recently and suddenly admitted into the *Blood*, in the Time of, or soon after, a plentiful Meal; or whatever can fetter or re-unite them with the grosser Parts of the *Blood*, as much as *Brandy* or spiritous fermented Liquors and *Opiats*. All these either by evaporating and wasting them, or by hindering their Production or Secretion, do bring on that Paucity of Spirits spoken of, and Sleep or some Degree of Sleepiness, as a necessary Consequence.

Yet it will be still true upon the same foot of Reasoning, that where the *Blood* is extremely depurated, and the Secretions and Excretions from it already perfectly performed, as in long Fasting the whole Mass of *Blood* is become only fit for the Secretion of Spirits; has no Crudity or Impurity in it, to absorb or fetter the Spirits already produced; and no crude *Chyle* admitted to answer that End; in such a Case *Opiats* can have no Effect, the Spirits cannot be absorbed, fettered or restrained, where the Qualities of the Mass of *Blood* do not concur to that Effect.

Another concurring Cause of the Inefficacy of *Opiats* in the Case of Fasting, is, that all the natural Parts, those, to wit, of the *Primæ Viæ*, which serve for Digestion, are at Rest, for want of the Weight and Stimulus of Food, and also of the *Gall* in the Case referred to, to keep up their peristaltic Motion; therefore few or none of the Spirits being spent on those Parts, there is a greater Supply sent to the animal Organs of Sensation and voluntary Motion; and indeed in such a Case even the vital Parts for Respiration and Circulation do act but very sluggishly

The poor Woman seems perfectly honest and artless, and even inclines strongly to Dotage. She very religiously throws the whole upon a Miracle.

Of a Man, who gave Suck to a Child, by the R. R. Robert, Lord Bishop of Corke, No. 461. p. 813. Aug. &c. 1741.

2. I will venture to give an Account of a Man that I met at *Inishan*, about 10 Miles from this Place. He was an old Man about 70 Years of Age, by Birth a *Frenchman*, but was a Refugee on account of his Religion, was bred a Gardener, and, by all Accounts, had been industrious, till deprived of his Strength by Age.

He asked me for Charity, and I gave him half a Crown. I mention this Particular, that the remaining Part of the Story may not seem to be told for the sake of Gain. After I had done this, and was gone into the House, I heard a Noise at the Door: The Man, out of Gratitude, had returned to shew me a Curiosity, which was that of his Breasts, with which he affirmed he had once suckled a Child of his own: His Wife, he said, died when the Child was about 2 Months old: The Child crying exceedingly while it was in Bed with him, he gave it his Breast to suck, only with an Expectation to keep it quiet; but, behold, he found that the Child in time extracted Milk; and he affirmed, that he had Milk enough afterwards to rear the Child. I looked at his Breasts, which were then very large for a Man; but the Nipple was as large or larger than any Woman's I ever saw. Some Ladies were then passing by; so I sent him off in Haste, and have not seen him since.

I have either heard or read of one Instance of this kind before.

Concerning some Children inoculated with the Small-pox, at Haverford-West in Pembroke-shire, by Mr Evan Davis. No. 429. p. 121. July, &c. 1733, dated Aug. 25, 1732.

V. Our Inoculators are two Surgeons of good Note and Repute in this Town (who also keep Apothecaries Shops) and are the only Persons that I hear of in these Parts who are come into that Practice. Upon my requesting it, I received from them this last Week the Account following.

Some little time before last *Christmas* the Small-pox appeared in this Town, chiefly of the confluent kind: Some had it with Purple-Spots, and other violent Symptoms, whereof several died. Towards the Spring, the Measles became more epidemical, and also more fatal, than the Small-pox. Some of the Subjects that had been visited but a little time before with the Small-pox, and upon their Recovery had their Bodies purged, yet died of the violent Cough which attended and succeeded the Measles, which afterwards seized them. The Measles continued to rage 'till almost all the Subjects in this Place were visited with them, the Small-pox continuing also during the whole time, yet making but a slow Progress; and to this time it has not left us.

About the End of *Feb.* last, Mr *Francis Meyler* inoculated his own Son, near 3 Years old, from a Child of about the same Age, who had the distinct Sort of Small-pox, but the Pustules small. He made a slight Incision on both Legs, which took only in one: After four Days a Pustule appeared on the Part wounded, but did not much inflame it, nor make much Progress. On the 7th Day the Child grew feverish,

feverish; and on the 8th, or towards the 9th Day (instead of the intended Small-pox) the Measles appeared all over his Body, attended with a Cough; at which time the feverish Disorder abated, till the 11th or 12th Day: Then he grew feverish again, and towards the 14th Day the Small-pox appeared, a small distinct Sort, and few in Number. After the Eruption was full, he grew hearty, and so continued, not being visited with a second Fever. After this Mr *Meyler* inoculated two other Children from his own Son, by applying the Matter after a slight Incision, to both the Legs of each of them, but it did not succeed. About the same time he inoculated two other Children, a little way out of Town, from a Neighbour's Child, but neither of them were infected. It's not succeeding he knows not what to impute to; whether to the Slightness of the Incision, or to the Want of a Sufficiency of Matter to infect with, or to the Want of a Disposition in the Subjects to be infected.

About the latter End of *March* last Mr *Richard Wright* inoculated a Daughter of *Tho. Kymer*, Esq; of this Town, between 3 and 4 Years of Age, from another Child of about the same Age, who had a distinct kind. The Matter was applied to one of her Arms, the Incision being made pretty deep. The Inflammation thereof began about the 4th or 5th Day, and afterwards appeared considerably great. She proceeded until the 7th Day in a very hearty and brisk State, at which time she began to grow heavy, sick, and very feverish. Then an Eruption of the Small-pox was expected; but her Fever increased, and the next Day there were Eruptions seen all over her Body, which proved to be the regular Measles. She was treated accordingly, and grew well, excepting a pretty severe Cough she had, and this Cough continued through the whole Course of the following Small-pox. About the 12th Day she sickened again, and about the 14th the Small-pox appeared, the distinct Sort, and very favourable; they came out, filled, and dried away very kindly, and were attended with very little of a second Fever. She went through the Distemper with a great deal of Chearfulness: She was purged afterwards, and seemed very well; but in a little time after, a Boil came on the lower Part of the Shoulder-Blade of the same Arm wherein she was inoculated, which was brought to suppurate, and was healed in a common Manner.

From this Subject last mentioned Mr *Wright* inoculated two Daughters and a Son of *Nicholas Roch*, Esq; at his Seat, about 5 Miles distant from this Town. These three Children were aged from 3 to 8 Years. The Incision was made in one Arm of each Child; it produced the same Effect on every one of them as it did on Miss *Kymer*, viz. the Measles on the 7th or 8th Day, and the Small-pox of the distinct Sort on the 14th Day. They went all three very well through every Stage of the Distemper; the secondary Fever was but slight. One of these had them somewhat thick, and the other two had a pretty many of the

Pox appearing over them likewise ; but they thoroughly recovered all of them, and have all since continued in a good State of Health.

I have just Cause, I conceive, to incline me to think very favourably of this Method, from what I have myself observed of it's Advantages. In the Beginning of this Year, I lost one Child out of five I had, by the Small-pox in the natural Way ; and I have seen what great Sickness and Misery the other four suffered, who all of them had the confluent Sort, in comparison with what the Inoculated underwent. One Boy of mine particularly, between 7 and 8 Years of Age, had it so violently, that his Life first, then his Limbs, Senses, and Intellects, were endangered by it ; and he is not yet fully recovered from the Effects of it to his former good Health and Strength, though he had it in Dec. and Jan. last, among those who first fell into it, when it came this last time to this Place.

P. S. Concerning the four Children above-mentioned, on whom the Operation did not succeed, but remained uninfected after the variolous Matter was applied in the usual Way to them. They have all of them since escaped the Measles, though most other Children about them had them, and none of them have yet had the Small pox, though it still continues in the Town. There are not many now that are sick of it, but it is of the bad confluent Kind, attended with Purple Spots, and watery Bladders that are mixed with the Purples. It is observed, that most of these who have of late been visited with it, have died thereof. This probably will incline some to use Inoculation again, and to make that Practice, under Providence, their Refuge. Oct 25, 1732.

A Paragraph taken from Dr E. Timons's History of the Inoculated Small-pox, communicated by S. Horfeman, M. D. No. 432. P. 296. Apr. &c. 1734.

VI. At first there was one, who cut the Skin with a Razor, and putting the dried Pustules of the Small pox into the Wound, made a Ligature upon the Place. But, besides the Pain, which occasions much Difficulty in performing this Operation on Children, it did not succeed. For sometimes the Small-pox came out slowly, and with a Crowd of the worst Symptoms : sometimes the Incision was in vain ; and the Places, where they were made, were filled with malignant Ulcers. To some also the Operation proved fatal.

A Letter concerning a Person who made bloody Urine in the Small-pox, and recovered, by Pierce Dodd, M. D. Fellow of the R. Coll. of Phys. Lond. and Phys. to

VII. Making bloody Water is universally esteemed as terrible a Symptom as any that can happen in the *Small-pox* ; and all who have writ concerning that Distemper, do unanimously agree, that it is a certain Forerunner of approaching Death. Dr Cade, indeed, says, in his Letters to Dr Friend, concerning Purging in that Distemper, that he has sometimes cured this Symptom, by the Help of *Campfire*, and a copious Quantity of Acids ; but then he adds, that this Relief was only temporary ; and that, to confess the Truth, he never knew any body, that made that sort of Urine, who ever survived the 16th Day from the Eruption : And there is no body whom I know, that has been conversant with this Distemper, but has constantly experienced, sooner or later, the like Fatality in consequence of it. I mean, when this

this sort of Urine has proceeded from a broken *Crafs* and Contexture, or, as it were, a thorough Diffolution of the whole Mass of Blood : For I know very well, that you shall now-and-then have several Streaks, and sometimes larger Quantities of Blood in the Urine, from the Acrimony of the *Spanish Flies*, upon the Application of Blisters, which are frequently used, and so frequently likewise absolutely necessary, in one or other of the Stages of this Distemper, and yet the Patient shall do well. And Dr *Browne* gives an Account of a Gentlewoman, who lived in *Dean's-yard, Westminster*, who made bloody Urine in the *Small-pox*, 4 or 5 Days together ; which made Dr *Needham*, who attended her, to forsake her, and yet she recovered : But they found afterwards, that this bloody Water was not occasioned by the Malignancy of the Distemper, but by a sharp Stone, which was at that time descending from one of the Kidnies through the Ureters into the Bladder, and which she afterwards voided.

St Barth. Hospital. No. 470, P. 559. Read June 23, 1743.

A young Spark, about 15 Years of Age, Son to a Gentleman of a very considerable Fortune in *Jamaica*, was taken with a Fever, and great Pain in his Head, *April* 20th last, and had the *Small-pox* come out upon him the Day following, notwithstanding which the same Symptoms still continued, and nothing almost would stay upon his Stomach, and his Head likewise was very delirious : He was obliged therefore to be blooded, and to take a Vomit, and to have Blisters applied to his Neck and to his Arms ; which, together with a proper Quantity of *Pulvis à Cbelis Cancrorum comp.* and *Nitre*, were the first things, that I had an Opportunity of ordering for him.

The next Day every thing was more quiet, and so again the third Day from the Eruption ; but the *Small-pox* were very numerous all over him, and of a little, rank, angry Sort ; as they generally are, I think, upon the *West-India* Constitutions : But this young Gentleman had besides over-heated himself a little before, by performing a Part at the *Mountain*, near *Eton*, where he was a Scholar.

Things continued in much the same State the 4th Day, but towards the Evening there were a few Streaks of Blood mixed with, and subsiding in his Water ; which did not much alarm me, because I did not know but it might be caused by the Blisters. I had but one Reason to doubt the contrary, and that was, he had little or no Strangury : But as certain Persons do aver, there is sometimes such, or even a more bloody Sort of Waters, occasioned by the Flies, even where there shall be no Strangury at all, I was willing to hope the best, and so made no other Alteration in my Process, than to direct a very free Use of *Spirit of Vitriol*.

What was ordered, happened to succeed : We had no more of that Sort of Water, either that Night, or the next Day, or the Morning following : But I was sent for in a great Hurry that Day, viz. the 6th, in the Afternoon, and found his Friends in the most terrible Conster-

nation ; not only because it returned, but began to increase upon them, and was pouring off in a free Manner.

It was necessary therefore to proceed in another Method, and I accordingly ordered some *Gum Arabic*, *Olibanum*, and *Pulvis Amyli*, and *Alum*, together with a Mixture of *Black Cherry-water* and small *Cinnamon*, and *Treacle-water*, with some *Tinctura Antiphtisica* and *Terra Japonica* in it, and the *Tincture* of *Roses*, strongly acidulated and sweetened with *Diacodium* ; upon the Use of which it began to abate, and the next Day the Urine returned to it's usual State and Colour.

There was nothing farther observable in the Course of this Case, except that the Distemper was of the coherent Kind, and accordingly attended with many other dubious Symptoms likewise : For though it is generally thought, that the coherent Sort is not so formidable as the confluent ; yet, as Dr *Freind* has judiciously observed, and *Moreton* before him, there is not so much Difference between them, but they are almost always attended with much the same Appearances, and the same Fevers plainly at the time of Maturation : For that the Danger does not arise so much from the Sort, as from the Number of the Pustules ; which if it be great, there is the like Reason to be fearful of the Event, whether they flux, or whether they only cohere : All which notwithstanding, this young Gentleman had the good Fortune to escape.

*The Case of Mr
— Cox,
Surgeon at Peterborough,
who fell into a
pestilential Fever, upon Tapping a Corpse
lately dead of
an Hydropsy-
drawn up by
himself. No.
454. p. 168.
July, &c.
1739.*

VIII. An elderly Gentlewoman, labouring of a Dropsy about 12 Months, underwent the Operation of Tapping four several Times, by which 35 Quarts of Liquor were discharged ; and dying at last of the same Distemper, I was desired by her Friends to let out the Water that was then contained in the *Abdomen*, as well to preserve the Corpse the longer from Putrefaction, as to prevent an Annoyance to the Company at the time of her Funeral . Yet notwithstanding this was done within a few Hours after Death, the included Humours were arrived to such a Pitch of Putrefaction, as to discolour the external Parts with a green and livid Hue. The Liquor itself was green, and somewhat thicker than new Milk, in Smell more fetid and offensive than what I ever met with, and so sharp and acrimonious in it's Nature, as deeply to corrode a Silver Canula, through which it passed. And what shewed it to be highly malignant, may be judged of from the following Circumstances.

The Night after the Operation, I was somewhat restless and uneasy, and the next Day afflicted with small Tremors, and an unusual Lassitude ; in about 3 Days after, several angry Pustules arose upon my Hands and Fingers, and I believe on every Place where the least Drop of Water fell ; some of which coming to Matter, went off soon ; those which did not, continued painful, and remained much longer. The Thumb of my right Hand, and middle Finger of my other, were affected more severely than any other Part, the Pain more exquisite, the Swelling more hard and large, and of a red dusky Complexion. This was about the 6th Day of my Illness, and although the strongest Suppuratives were made use of, yet they failed of the desired Success,

the

the Pains being continual. Being persuaded from the great Pulsation and heavy Pains I underwent, that Matter must lodge either under or upon the *Periosteum*, an Incision was made to the Bone, by which only 2 or 3 Drops of Matter were discharged. 'Twas expected this small Discharge might in some measure mitigate my Pain, but it did not; the same Evening, that Pain I at first complained of was changed into universal Convulsions, and the Oppression upon my Vitals so great, as to threaten immediate Death.

The Intentions of Cure (which were strictly attended to, by Dr Charles Balguy) were to fortify the Heart with Cordials, to enable it to resist and throw out the Malignity, and to bring the Sores to a plentiful Digestion.

The first was treated with the highest Alexipharmics; the latter, as at first, with strong Suppuratives: This being about the eighth Day of my Illness, and the Convulsions continuing, with an unequal and low Pulse, and as there was little Appearance of Matter, Blisters were plentifully applied, as near to the Parts affected as possible, in order to make a Revulsion from the Heart, and throw off the morbid Matter by the Wounds. In about 3 Days this Point was gained, the Convulsions began to abate, and the Wounds digest; in four more, I found a Cessation of Symptoms, except a Faintness and Lowness of Spirits, which hung upon me for a great while after, which pestilential Fevers (as this was judged one in an high Degree) are known always to leave behind them.

I suppose I might receive this Infection as much by Inspiration as Contact; for some of my Assistants, who were in the Room only, and never touched one Drop of the Liquor, found themselves much disordered, and afterwards broke out with red and livid Eruptions; which sufficiently shewed, that not only the Liquor itself, but the *Effluvia* too, were in the highest Degree subtle and malignant.

IX. If the Venereal Disease was never known in Europe till the Siege of Naples 1495, it must have made a very quick Progress thro' Europe in a short time; for in 1497, I find it raging in Edinburgh, and our King and his Council terribly alarmed at this contagious Distemper, as appears from a Proclamation of King James the IVth, in the Records of the Town-Council of Edinburgh. The Minute of Council is dated the 22d of September. I have pretty nearly observed the old Spelling, except in Numbers.

An Extract from the Books of the Town-Council of Edinburgh, relating to a Disease there, supposed to be Venereal, in the Year 1497. by Mr Macky, Professor of History, at Edinburgh. No. 469. p. 420. Read March 17. 1742-3.

“ 22. Sept. 1497.

“ It is our Soverane Lords Will and the Command of the Lordis
“ of his Counsaile send to the Provest and Baillies within this bur^t that
“ this Proclamation followand be put till execution for the eschewing
“ of the greit appearand danger of the Infection of his Leiges fra this
“ contagious sickness callit the *Grandgor* and the greit uther Skayth
“ that may occur to his Leiges and Inhabitans within this bur^t; that is

“ to

" to say, we charge straitly and commands be the Authority above
 " writtin, that all manner of personis being within the freedom of this
 " bur^t quilks are infectit or hes been infectit uncurit with this said
 " contagious plage callit the *Grandgor*, devoyd, red and pass fur^t of
 " this Town and compeir apon the sandis of *Leith* at ten hours before
 " none and thair fall thai have and fynd Botis reddie in the havin
 " ordanit to them be the Officeris of this bur^t reddely furneist with
 " victuals to have thame to the *Inche**, and thair to remane quhill
 " God proviyd for thair Health: And that all uther personis the quilks
 " taks upon thame to hale the said contagious infirmitie and taks the
 " cure thairof that they devoyd and pass with thame sua that nane of thair
 " personis quhilks taks sic cure upon thame use the samyn cure within
 " this bur^t in pns nor peirt any manner of way. And wha fa beis foundin
 " infectit and not passand to the *Inche* as said is be *Mononday* at the
 " Sone ganging to, and in lykways the said personis that takis the sd
 " Cure of sanitie upon thame gif they will use the samyn thai and ilk
 " ane of thame falle be brynt on the cheik with the marking Irne that
 " thai may be kennit in tym to cum and thairafter gif any of tham re-
 " mainis that thai fall be banist but favors."

An extraordi-
 nary Venereal
 Case, by John
 Huxham,
 M. D. F. R. S.
 No. 460. p.
 667. dated
 Plymouth,
 Oct. 16. 1739.

X. Mr R. B. aged about 27, of a bilious, dry Constitution, had,
 for some Years before his Death, contracted a virulent *Gonorrhæa*,
 which was scarce well cured before he got a second, and at length a
 third. To complete his Misery, being in the Fleet at *Porto-Bello*, he
 had frequent impure Conversation with some of the *Negro* Huffers (who
 probably laboured under the worst Species of the *Pox*, called the
Yaws).

He returned with a very troublesome Itching all over him, though no
 Pustules appeared; was much thinner than usual, and had a horrible
 stinking Breath, and spit frequently a foul, corrupt Matter. As he
 had no Running, Ulcer, *Bubo*, or *Nodes*, he thought all safe. But
 not many Days after his Arrival at *Portsmouth*, *post impurum cum impura*
Coitum, a violent Green-coloured *Gonorrhæa* appears. For this he put
 himself under the Care of a Surgeon, who, after much Pains to no Pur-
 pose, endeavoured to salivate him, but that also in vain. The *Gonor-*
rhæa indeed was much abated; but a *Bubo* was risen in his left Groin,
 and some small verrucose Eruptions about the *Anus*.

In this Condition he returned here, and put himself under the Hands
 of Mr St—, an ingenious Surgeon, who endeavoured to bring the
Bubo to Suppuration, but without Effect; for it soon receded, and
 forthwith violent Pains seized him in and about the Fundament, which
 soon produced an exceeding painful *Phyma* near the Verge of the *Anus*
 on the left Side.

I was consulted now, and advised to bring it to Suppuration as soon
 as possible, which was done in 2 Days; from whence issued abundance

* An Island in the Frith of Edinburgh over-against *Leith*.

of purulent bloody Matter. In a Day or two more, another appeared on the other Side, which soon vented the like Matter. The *Verrucae* also now grew more numerous and large, and many pustular and scaly Eruptions appeared all over him.

I ordered him to be fumigated with *Cinnabar*, and advised him to enter on a Salivation forthwith. But, antecedent to it, as his Humours were exceedingly tough and acrid, I put him on a Course of very plentiful Dilution; and this the rather, as he was naturally of a dry and hot Constitution, and besides had lately been roasted in the *Torrid Zone*.

I began, as usual, by giving him *Calomel*; which, though it neither purged or vomited him, yet, after having taken 3v, produced no Degree of Salivation, nor did it make his Gums sore. However, it brought on his *Gonorrhœa* again: I then ordered him once and again 8 or 10 Grains of *Turbit Mineral*, which scarce puked him, and gave him only 2 or 3 Stools. I now found, indeed, that *Mercury* and he, as well as *Venus*, had been old Acquaintance; so I greatly augmented the Dose of the *Mercurials*, ordering immense Quantities of thin watery Diluents: Notwithstanding this, there was very little Operation by Stool, and scarce any by Salivation. Though his Gums and *Fauces* were very sore and swollen, he scarce spit one Pint in 24 Hours, and that excessively tough and fetid. Even under this strong *mercurial* Course, the pustular and leprous Eruptions increased daily, so as to cover almost his whole Body, nay his very Face. His Hands and Feet were vastly swollen, as in an *Elephantiasis*, with horrid Fissures, from whence issued a very stinking ichorose Matter.

I was quite confounded at this dreadful Face of Things, and seriously bethought me what further Method could be taken against so terrible an Enemy. I had recourse to a warm emollient Bath, in which his whole Body was emerged; after which he was well anointed with a strong *mercurial* Ointment. This was done for 3 Days successively: Notwithstanding which, though his Chaps grew exceeding sore, and his Throat so much inflamed and pained, that he swallowed with extreme Difficulty what he sucked through a Pipe or Quill, yet the Spitting was very little increased, and as tough as ever: Nor did the fistulous Ulcers seem in the least disposed to heal up, but vented a vast deal of stinking, oily, sanious Matter; nay, even new ones broke out under each *Axilla*, and a very large *Phyma* rose on the *Coccyx*, which soon discharged the same kind of virulent Matter; though we found the Bone, and even the *Periosteum*, quite sound and untouched.

The Scales were now grown so hard and stiff, that he could scarce bend a Limb, or Finger: Moreover, Abundance of Ulcers, from whence flowed great Quantities of greasy, purulent, and somewhat bloody Matter, were broke out in his Thighs and Buttocks. A very large Tumour was also risen in his right Breast, and soon after on the left, voiding prodigious Quantities of the same kind of Matter.

It

It was observable, that where-ever any of these Ulcers appeared, they ran only under the Skin, being entirely seated in, and feeding on, the *Membrana adiposa*; so that the Muscles and Tendons underneath appeared as fair and florid as in the most healthy Constitution.

I now unfortunately found, though too late, there was nothing to be done by *Mercury* in any Form; and therefore determined to run it off, and try the *Guaiacum* Method and Sweating, so much recommended of old (and in some Cases so justly) by Sir *Ulric Hutton*, and others; at the same time keeping up a most plentiful Dilution, attempting withal to detach the scaly *Cuticle* by continued emollient Baths, which at the same time also would partly act by Dilution. By this means the Scales came off apace, just in the manner usual in the confluent *Small-pox*; only the *Exuvia* were here much larger, several being above 4 or 5 Inches over. In about a Week's time, this Coat of Mail was pretty well cleared off, and his Breath, from the most horribly nauseous I ever smelt, became as sweet as that of an Infant. Nor was the Matter spit, though still very viscid, any way fetid: For the *Mercury* was pretty well run down by lenient Cathartics, and the Sloughs of his Mouth cast off.

He was now become exceedingly emaciated: Wherefore I ordered him plentiful liquid Nourishment with Vipers, and large Dilution, avoiding every thing that was in the least gross or fatty. But with all this he still kept to his 3 Pints of strong Decoction of *Guaiacum* every 24 Hours, sweating at least 2 or 3 of them.

Under this Method I conceived some Hopes of his Recovery, as he seemed now to gain some small Degree of Strength and Spirit; but still his Ulcers rather increased than abated, and continually discharged a vast Quantity of Matter, though by no means so thick, putrid, or bloody; and, indeed, in a most profuse Manner from under each *Axilla*.

But, what is vastly surprising, notwithstanding all the past Method and Medicines, two very large Chancres now appeared on the *Glans Penis*, and a very considerable *Bubo* in the left Groin. A troublesome Cough soon also seized him, with Shortness of Breath; and he began to expectorate a purulent, and sometimes bloody kind of Matter. As the whole *Membrana adiposa* without, had been consumed by the Disease, it was now falling on that Part of it that invested the more vital Parts. But Nature could support no longer. He died in the extreme Degree of a pocky Consumption. But not one single Bone of any Part of his Body appeared to be touched, though he died with near 40 Ulcers upon him.

The Case of a
Cataleptick
Woman, by
Richard Reynell,
Apothecary,
London.

XI. *Ann Bullard*, a Servant, about 21 Years of Age, had been for some time irregular in her *Menses*, and very much afflicted for the Loss of a Friend. July 10, 1730, she complained of a Pain in her Head, Sickness in her Stomach, with a general Disorder, and took *Gascoign's* Powder for a Sweat: Next Morning, July 11, about 9, she was found in

in Bed, senseless, stiff, and void of Feeling, with her Eyes shut; and upon the first Surprise, it was thought she was dead. When I came, I found her in a true *Cataleptick Fit*, senseless, without Motion, her Limbs very stiff, but warm, and not easy to be bent; but in whatever Posture any Limb was put, it continued in the same, whether erect, or reclined: Her Respiration was good, but her Pulse low, and irregular; she had no Catchings, or convulsive Motions, but could not, by any Means used, be brought to herself (in any respect). A Vein was opened in the Arm, and ℥xij of Blood taken away; she bled freely, and came a little to herself, but could not speak. I then gave her this Draught: $\text{℞ Aq. Mentb. Rutæ. Bryon. Co. } \overline{\text{a.}} \text{ } \text{℥vj. Sal. volat. Corn. C. } \text{℥ss. Sacchar. Albiss. } \text{℥ij. f. haust.}$ and 5 Spoonfuls at pleasure of the following Julep: $\text{℞ Aq. Puleg. Rutæ. Mentb. } \overline{\text{a.}} \text{ } \text{℥ij. Aq. Bryon. Co. Nephrit. } \overline{\text{a.}} \text{ } \text{℥iss Tinct. Castor. } \text{℥ij. Sacch. Albiss. q. s.}$ In a few Hours she came to herself: I then asked her, whether she knew how she was taken? She replied, that she had been restless and uneasy till about 4 in the Morning, when she believed she fell into the Disorder she was found in; but remembered nothing that had happened besides. She complained of a Dizziness in her Head, with a violent Pain in the Fore-part of it and Sickness in her Stomach, and was a little feverish. I gave her the following Vomit at 4 in the Afternoon: $\text{℞ Aq. Card. bened. } \text{℥j Pulv. Ipecac. } \text{℥ss. Vitriol. alb. depurat. gr. vj. Oxym. Scillit. } \text{℥iss f. haust.}$ The Vomit worked kindly, and she seemed relieved by it: About 6 in the Evening another Fit returned, much in the same manner as before; but she soon came out of it, and then took the Draught with the volatile Salt of Harts-horn, as before; and I applied a large Blister to her Back, and 2 more to her Arms: About 9 the same Evening she had a strong Convulsion-Fit, with Catchings, Grinding of the Teeth, and a great Tremor, neither of which she had had before; she had a Stool the preceding Night, but none that Day. I gave her the Draught as follows, at Night going to Rest: $\text{℞ Tinct. Hier. cum Vino fact. } \text{℥ij. Aq. Mentb. } \text{℥vj, Spt. Lavend. Co. } \text{℥ss,}$ and she continued taking the Draught, with the volatile Salt, &c. every 4 Hours. July 12, she had been light-headed all Night, with little or no Rest; the Blisters were dressed, which discharged plentifully, and the Tincture had given her 3 Stools in the Night, which had made her a little faint; her Pulse was low, and her Water pale. I saw her in the Evening, when she had slept pretty well, with which she was refreshed; the Pain in her Head but little, her Stomach easy, and I found her in every Respect better. The Draughts were continued every 6 Hours, and she took of the Julep before-mentioned, when faint or ill. July 13 in the Morning, I found her Head easy, her Water higher coloured; she was allowed Broth, and Food of easy Digestion, which agreed very well with her: She sate up in the Afternoon, but was faint, and her Head giddy; but when in Bed, she was better: She had no Stool that Day. I gave her a Draught with the volatile Salt, &c. at Night going

Experiments made upon Mad Dogs with Mercury.

to Rest, and the following Purge the next Morning. *R. Tinct. Hier. cum Vino fact. ʒiſſ Syr. è Spinâ Cerv. Aq. Puleg. a. ʒvj. Spt. Lavend. Co. ʒj.* July 14, the Purge worked 5 times; she eat a light Dinner, and was easy; but upon walking about the Room, her Head was giddy, and she trembled very much, but when in Bed, she was better. I gave her the following Draught at Night going to Rest: *R. Aq. Rutæ Puleg. Bryon. Co. a. ʒvj. Spt. Corn. C. opt. gutt. 40. Tinct. Castor. ʒj. Sacchar. Al. biſſ. paululum.* July 15, she complained, when up, of a Numbness in her Legs, and a Pricking in them, like to what happens when the Legs are what we commonly call asleep: Her Appetite was better, and she was in every respect amended. She took the following Medicines: *R. Pul. Rad. Valer. Sylv. ʒij. P. Castor. Russ. ʒj. Asæ fætid. ʒj. Tinct. Castor. q. s. f. Massa Pilul. cujus formentur Pilul. No. 40.* of which she took 4 twice a Day with a small Draught of this Julep: *R. Aq. Ceras. Nigr. ʒvj. Aq. Rutæ. Pæon. Co. a. ʒij. Spt. Lavend. Co. ʒvj. Syrup. Caryoph. q. s.* of which she took likewise 5 Spoonfuls at pleasure. The Blisters were kept running as long as we could; and when they were dried up, July 19, I gave her the same Purge as before. July 22, she had continued very well, without any Return of a Fit; but upon cutting an Issue in her Arm, she fell into a third Fit, in which she continued near 2 Hours, but then came to herself, and was well that Evening. July 29, the Purge was repeated. Aug. 6, she complained of a Pain in her Head, Sicknes in her Stomach, and some Days before, she had a Shew of the *Menses*, and had vomited near a Pint of Blood, and was costive: I then advised her to take 2 Spoonfuls of *Tinctura Sacra*, every or every other Night going to Bed, as she found it necessary, and 40 of the following Drops: *R. Spt. C. C. opt. ʒiij Tinct. Helleb. Nigr. ʒv.* to be taken twice a Day in Chamomile-Tea. She took these Medicines about three Weeks, which answered Expectation, and I left her well. I saw her about 12 Months after, and she told me, she had continued very well ever since.

Experiments made upon Mad Dogs with Mercury, by Dr Robert James of Lichfield. No. 441. p. 244. Apr. 6c. 1736.

XII. About Mich. 1731, I waited on Mr Floyer, of Hints, a Gentleman who is very curious in Fox-Hounds. He complained that he was afraid of a Madness amongst his Hounds; for that Morning one had run mad in the Kennel, and he was apprehensive that most of the rest were bit by him: I took this Opportunity of telling him, that I had long believed that *Mercury* would, if tried, prove the best Remedy against this Infection; and that if the Idea I had formed of this Poison was just, I was pretty sure the Medicine would answer, notwithstanding the Difficulty there is of determining the Effects of a Medicine *à priori*; and that it was, at least, worth while to try. Mr Floyer neglected this Advice till the February following. Mean time he tried the Medicine in *Bates*, commonly known by the Name of the Pewter-Medicine; as also every thing else which was recommended to him by other Sportsmen, but to no Purpose; for some of his Hounds run mad almost every Day after Hunting. Upon this he took his Hounds to the Sea,

Sea, and had every one of them dipt in the Salt-water; and at his Return, brought his Pack to another Gentleman's Kennel, 6 Miles distant from his own. But, notwithstanding this Precaution, he lost 6 or 7 Couple of his Dogs in a Fortnight's Time. About this time, which was in *Feb.* I waited on him at his new Habitation, and found him in that Distress not unusual with Sportsmen upon these Occasions. I asked him if he had tried the Experiment I recommended. He said he had not, but that two of his Hounds were then mad, and he would that Night do it. He shewed me the Dogs, and they were both as far gone as I ever have seen any. They refused Food of all Sorts, particularly Fluids, flavered much, and had all the Symptoms of a *Hydrophobia* to a great Degree. He sent immediately to *Lickfield* for all the *Turpeth Mineral* he could get, and that Night gave gr. xij a-piece to the two Dogs, which vomited and purged them gently. 24 Hours after this, he gave to each 24 Grains, and after the same Interval he gave 48 more to each. The Dogs salivated considerably, and soon after lapped warm Milk. At the End of 24 Hours more, he repeated to one Dog 24 Grains more, and omitted it to the other. The Dog that took this last Dose, lay upon the Ground salivated extreamly, was in great Agonies, and had all the Symptoms of a Salivation raised too quick; but got through it, and is at this Time alive. The other relapsed and died.

To all the rest of the Pack, he gave gr. vij of the *Turpeth* for the first Dose; the second 12, at 24 Hours distance, which was repeated every other Day for some little time. The Method was repeated at the two or three succeedings Fulls and Changes of the Moon. From this time he lost not another Hound; and though several have since been bit by strange Dogs, the *Turpeth* has always prevented any ill Consequences.

I and my Friends have tried the same Thing since upon a Multitude of Dogs, and it has never failed in any one Instance, though Dogs bit at the same time, and by the same Dogs, have run mad after most other Methods had been tried.

As to the Experiments made upon Mankind, I have had Opportunities of making but 3.

The first was about 2½ Years ago, upon a Girl about 14 Years old. The Calf of her Leg was so torn by a mad Dog, that the Surgeon was obliged to use Means to prevent a Mortification from the Bite. She was vomited by the *Turpeth*. Three Days before the next Change of the Moon, the Vomit was repeated, and again the very Day of it's changing. The same Method was pursued the next Full Moon. The Girl is very well.

The second was a Boy of about 10 Years of Age. He had 4 Holes in one of his Legs, made by a mad Dog in *November* last. The *Turpeth* was given as above, and the Wounds dressed with Digestives,

Experiments made upon Mad Dogs, with Mercury.

and he continues well. These two lived near *Burton upon Trent*, and *Mr Towndrow*, of that Place was Apothecary.

The third Case was that of a young Man near *Tamworth*, of about 18. The Bite was upon the Hand. A great Number of Dogs were bit at the same Time, in the Town where he lived. About 6 Days after the Mischief was done, several Dogs that had been wounded, ran mad, upon which he applied himself to *Mr Wilson*, Apothecary in *Tamworth*, to whom I had communicated the Success of the *Turpetb* in this Case. The young Man was, at this Time, very melancholy and dejected, had Tremors, and slept very little for some Nights before, though he was not apprehensive that the Dog which bit him was mad. He had a dry Scab upon his Hand: He was, upon applying to *Mr Wilson*, vomited with *Vin. Benedict.* ʒij.

The next Thing he took was made according to the following Prescription.

℞ *Turpetb.* Min. gr. xij. *Lap. Contrayerv.* ʒi. *Tber. Androm.* q. s. *M. F. Bol.* N°. 3, *sumat unum singulis noctibus hora decubitūs superbibendo* *ʒulap.* seq. *Cochl.* iv. ℞ *Aq. Rut.* ʒvj. *Tberiac.* ʒij. *Syr. Pæon.* c. ʒiſs *Tinct. Castor* ʒij *M. F. ʒulap.*

Upon taking these he sweat very much, and had two loose Stools every Day after them: His Tremors went off, and slept better. After this he went into the Cold-Bath, and continues perfectly well.

But what is remarkable in this Case is, that the Wound ran a thick digested Matter after this Method, and threw off the Scab like an *Eschar*; after which it healed of itself.

Give me leave to make an Observation or two upon the Antiquity of this Disease, which I the rather choose to do, because *Cælius Aurelianus*, in his Account of it, does not seem to build so much upon the Authority of *Homer* as, in my humble Opinion, he might have done. Indeed he quotes a Passage out of the eighth *Iliad*, where *Teucer* calls *Hector* κυνὰ λυσσητήρα, but does not seem to think this sufficient to prove that *Homer* was acquainted with this Madness. But he omits two more Passages in the same Author, which joined with this, amount to a Demonstration that *Homer* was by no means ignorant of it. The first is in the ninth *Iliad*, where *Ulysses* is upon his Embassy to *Achilles*. He describes to the last mentioned Hero, the Distress the Grecian Army was in through his Absence; and when he has painted *Hector* as terrible as he can, he compares his Fury to the Rage of a mad Dog. *Iliad* Lib. ix. l. 237.

Ἐκτωρ δὲ μέγα δένει βλεμεαίνων
Μαίνειται εκπάγλως, πῶσιν Διὶ, ἃδὲ τι τίει
Ἀνέρας ἃδὲ Θεός· κρατερὴ δὲ ἔ λύσσα δέδυκεν.

If *Homer* had designed to describe a mad Dog as a Physician, he could not have expressed his Looks by a more proper Word than βλεμεαίνων. It must also be considered, that this Discourse is directed to *Achilles*,

Achilles, who, having studied Physick under *Chiron*, was consequently more capable of receiving an Idea of the Mischief *Hector* did to his Countrymen by this Metaphor.

In the thirteenth *Iliad*, *Hector* is again called *Λυσσώδης*, by *Neptune*.

It must be observed, that *λύσσα*, *λυσσήτης*, and *λυσσώδης*, can properly, and in their natural Signification, be applied to no other Madness than that which is peculiar to a Dog, though metaphorically it may, as in the Instances I have given, as also in *Sophocles* and *Euripides*. The Word *λύσσα* or *λύττα*, is used to signify the Madness of Dogs by *Aristotle*, *Galen*, and *Dioscorides*. And *Λυσσώδης* is used by the last-mentioned Author to signify a Man bit by a mad Dog. *Λυσσάω* is used by *Aretæus* in this Sense, and *Λυτῶσαις* by *Plutarch*, to express the same Thing.

What I would infer from this is, that *Homer* was certainly acquainted with the Madness of Dogs; and if Dogs in his Days ran mad, 'tis probable they would bite Men, and if so, to be sure, an *Hydrophobia* would be the Consequence; notwithstanding that *Plutarch* will have it, that it was first taken Notice of in the Days of *Asclepiades*, who was famous for his Practice in *Rome* before the Death of *Mithridates*.

Another strong Evidence of it's Antiquity is that Instinct which directs every Dog to avoid him that is mad, upon smelling, seeing, or even hearing him. If this is not Instinct, it is Reason; and that in a higher Degree than we ourselves can pretend to. Now Instinct must be coeval with the Creation, or at least the Fall; and therefore Madness must not be much younger.

XIII. I. The famous DAMPIER'S POWDER against the BITE of a MAD DOG, was first published by Sir *Hans Slaane*, Bart. when *Secr. R. S.* in Numb. 237. of these *Transactions*, Anno 1698*. which afterwards, when he was President of the Royal College of Physicians *London*, by his Proposal, was introduced into the *London Pharmacopœia*, under the Name of *Pulvis Antilyssus*, Anno 1720. The Composition of which is, *Ash-coloured Ground Liver-wort* and *black Pepper*; The Manner of giving it, not only to Men, but to Dogs and Cattle, is accurately set down in the above-mentioned *Transactions* †.

Of curing the Bite of a mad Dog, by C. Mortimer, R. S. Sec. No. 443. p. 319. Oct. 1736.

I shall only beg leave to add a Proposal of my own, which I made in my *Thes. Inaugur. de Ingressu Humororum in Corpus Humanum*, Ludg. Bat. 1724. That the Use of the hot Bath, for Persons bit by a Mad-Dog, or hot Fomentations, might be of greater Service than cold Applications: For a cold Bath shuts the Pores, as a warm one opens them; therefore the Blood being allowed to be greatly inflamed in this Case, and *Dampier's Powder* being a very hot Medicine, it is reasonable to think, that

* The *Lichen cinereus terrestris* is mentioned as being said to be exceedingly efficacious in curing Dogs bitten by Mad Dogs; in a Letter of Mr *Oldenburgh's*, *Secr. R. S. Lond.* July 6, 1672. See *Derham's Collection of Philosoph. Letters* between Mr *Ray* and his Correspondents, p. 110. printed at *London*, 1718, 8vo.

† See Vol. III. Chap. V. §. xxix. 3.

Of Curing the Bite of a Mad Dog.

when a Patient takes it, the setting him up to the Chin in hot Water for some Hours, would help the Operation of the Powders, by diluting the Blood, and relaxing the Pores.

An Addition to
the foregoing
Article, by the
same. Ibid. p.
360.

2. I thought it proper to add the following Passage, taken out of the Journal-Book of the Royal Society, supposing it to be what Mr Oldenburgh hints at in his Letter.

“ Nov. 16, 1671. [Sir Robert Moray] exhibited a certain Plant, (which was by Mr Ray called *Lichen terrestris cinereus*) said by Sir Robert Moray to be very good to cure Dogs bitten by mad Dogs : His Royal Highness having caused it to be given to a whole Kennel of Dogs, bitten by a mad one, which were all cured, except one of them, to whom none of it was given.”

The Specimen was kept in the Repository.

The same Virtue is likewise ascribed to this Plant, in the Third Part of Morison's *Plantar. Hist.* Oxon. where the Author, speaking of the *Lichen terrestris cinereus*, Raii *Hist. & Synops.* says, *Adversus morsum canis rabidi egregium est Medicamentum.*

Dampier, and the College of Physicians, in their *Pulv. Antilyssus*, prescribe equal Quantities of the *Lichen* and *Pepper* : But Dr Mead, in a single *Quarto Leaf*, published by him Anno 1735, hath altered the Proportions of the Composition, prescribing double the Quantity of *Lichen* to that of the *Pepper*. This Difference in the Proportions must be left to the Judgment of Practitioners ; but upon the Authority of another Minute in the Society's Journal-Books, it may not be improper to make an Addition to the above-mentioned Dampier's Powder.

“ March 7, 1671-2. Sir Robert Moray mentioned, that a whole Kennel of Dogs, belonging to his Royal Highness, were bitten by a mad Dog, and had been lately cured by a certain Herb called *Stellaria*, or *Star of the Earth*.”

This Plant is the *Lychnis viscosa*, flore muscosa Casp. Baubin. in English *Spanish Catch-fly*. See these *Transactions*, N^o 187 *, where is a Receipt to cure mad Dogs, &c. wherein this Plant is a principal Ingredient ; which Receipt, communicated by Sir Robert Gourdon, was there published by his MAJESTY's [special] Command, Anno 1687.

Wherefore, suppose the Composition were to be thus :

Take Ash-coloured Ground-Liver-wort, black Pepper, and the Herb Spanish Catch-fly, all finely powdered, of each ʒij, for 4 Doses, to be taken as Dampier prescribes in his Letter.

The Case of a
Lad bitten by a
Mad-Dog, by
Mr Edward
Nourse,
F. R. S. and
Chirurgion to
St. Barth.
Hospital. No.
445. P. 5.
Jan &c. 1737

XIV. Stephen Bellas, aged about 16, some time in June 1735, was bit by a mad Dog through the Nail of his right Thumb : I was called immediately upon the Accident, when I proposed to make a Ligature above, and to cauterize the wounded Part ; but that not being complied with, I desired Mr Garnum the Apothecary, who was present, to make up the Remedy mentioned by Dampier †, (viz.) ℞ *Lichen. ciner.*

* Vol. III. Chap. V. §. xxxix. 1.

† See the preceding Section.

terrestris,

terrestris, Piper. niger. aa ʒi. f. Pulvis. Of this Powder he took a Dram, within an Hour after he was bit ; repeated it the next Morning before he set out for *Gravesend*, where he was 10 Days, and dipt in the salt Water every Day ; during which time he repeated the Medicine Night and Morning, and continued so to do for 40 Days. This Boy was without the least Sign of being affected by the Poison, till Jan. 1736-7, when in the Evening he complained of a Numbness in 3 of the Fingers of the Hand that was not bit. The next Morning he was sick, had great Pain across his Stomach, and in all his Bones ; in the Evening I was sent for to bleed him, the People about him supposing he had got cold. When I came, I found him feverish, with a hard full Pulse : I asked what Complaints he had ? He told me those above-mentioned. I enquired what Nourishment he had taken that Day ? The Answer was, None, for he could not swallow ; whereupon I looked into his Mouth, but there was no Inflammation ; neither did any thing occur to me that could possibly produce the Difficulty of swallowing, he said, he had : I offered him some Sack-whey in a Bason, but he started at the Sight of it, neither would he suffer it to come near him ; I then offered him a Spoonful, which I prevailed upon him to swallow : The Moment it was down, he was convulsed, and a remarkable Horror appeared in his Countenance, which was succeeded by a profuse Sweat all over his Face and Head. He afterwards took another Spoonful ; the Consequence was as before, but in somewhat a higher Degree : I was now convinced, that this was the *ὑδροφοβία*, and that it arose from his having been bit 19 Months ago ; for after the most strict Inquiry, it does not appear that he has been bit by any Animal since ; and if he had, it is very probable I should have known it, his Master living next Door to me, and the Boy knowing how much Danger we thought him in, when he was bit : I acquainted his Friends with my Apprehensions, and desired farther Advice ; upon which Dr *Monro* was sent for, who ordered him to be let Blood, a Repetition of the above-mentioned Medicine in a Bolus every four Hours, and a Clyster : He was blooded, and the Clyster was injected ; but he was prevailed upon to take but one of the Bolusses. This Night was spent with great Inquietude, and without any Sleep : On the 13th in the Morning he was generally convulsed, and had frequent Reachings and Yawnings alternately ; about Noon his Mind (which till then continued sound) left him, and he raved and foamed at the Mouth till 5 in the Afternoon ; at which Time Nature seemed quite spent, and he lay very quiet till 7 when he died.

I cut this Boy for the Stone last Summer, about a Year after he had been bit ; I never saw a Wound more disposed to heal, and he was well and abroad in 5 Weeks.

XV. I imagined the Use of the *Lichen cinereus terrestris* with black Pepper, had been so infallible a Remedy for the Bite of a mad Dog, that there needed no Proofs of it's Virtue : I myself have used it upon Dogs, and always with Success ; and it is strong in my Memory, that

Concerning the Effects of Dampier's Powder, in curing the Bite

some

of a mad Dog,
by Joh. Fuller,
Esq; jun.
F. R. S. No.
448. p. 272.
June, &c.
1738.

some Years ago, a *Mad Dog* or *Cat* (I forget which) had bit some Children and the Mother, at *Battle*; the Chirurgeon came over to my Brother, Dr *Rose Fuller*, and we all went out in a Snow, with a Broom, and found some of it, and mixed it as the Account of *Dampier* directed. They all took it, as well as a Dog or two that were bit, and none of them had any bad Effects from the Bite.

This last *Christmas* 1737, my next Neighbour's Servant imprudently going to search whether a Dog suspected to be mad, had been wormed, (which Dog died mad in 3 or 4 Days afterwards) was bit very much in both his Hands: He went to a Person near me, who has had such Success, as to be applied to far and near, and who told me he would venture his Life against a Crown-Piece, if a Man, or any Animal, was brought to him within 3 or 4 Days after the Bite, that he cured him. I saw the Man that was bit every Morning, and he told me his Doctor went into the Fields, and gathered an Herb that grew very near the Ground, like a dried Leaf, and mixed it with *Pepper*. I shewed him some *Lichen cinereus terrestris*, and he said he believed it to be the same. Every Day he took his Medicine, about 10 or 11 of the Clock, he complained of a violent Heat, and Pain in his Head, which I was afraid was the Effect of the Bite, and not the Medicine: But after he had taken it for such a stated Number of Days, he grew better, and has continued well ever since. He had tied his Fingers with *Shoe-maker's* Ends, which are often used for a Cut; and they were all very much inflamed, and very sore. I made him take them off, and all his Plasters, and wash his Hands with Salt and Water, and in a Fortnight's Time they were quite well.

A Case of a
Person bit by a
mad Dog,
drawn up by
David Hart-
ley, M. A.
and Mr Fr.
Sandys. Ibid.
P. 274.

XVI. About the latter End of Nov. 1732, Mr *Soame's* Groom was bit in the Hand by a *Mad Dog*, so as to fetch Blood. It was not known in the Family for 3 Days. On the 4th Day, when *Fr. Sandys* first saw it, the Wound was healed; but it was opened again by him, and kept so for some time, but at last healed sooner than was intended, by the Neglect of the Servant. He was bled, took a Purge, after that half an Ounce of *Pulvis Antilyssus* every Morning for 3 Mornings, and was ordered to go into cold Water every Day for some time; but he neglected it after the 3d Day. Besides this, *Fr. Sandys* ordered him to forbear all Meats, and drink nothing but Water. He continued in this Regimen for about 5 Weeks; then finding himself well, would confine himself no longer to it.

Jan. 7. following, he was seized with a Sicknefs, Vertigo, and faltering in his Speech and Memory; and at last his Vertigo increased to such a Degree, that he fell down twice in the Space of $\frac{1}{2}$ an Hour; and the last time did not recover his Senses, till he was put to Bed, and blooded by a Person in the Neighbourhood, to the Quantity of 18 or 20 Ounces, by his Master's Order. *Fr. Sandys* was sent for, but could not come. He continued all Night restless and fullen, and in the Morning was blooded again, to the Quantity of 15 Ounces. *D. Hartley*

was

was sent for, and came about 8 at Night, and found him very sullen, thirsty, but averse to drinking, and his Pulse quick and hard. He ordered him to be put into the cold Bath; but he refused to comply with it, till he saw that Force would be used. About Midnight his Pulse rising, he ordered him to be bled to the Quantity of 16 or 18 Ounces: He continued all Night restless. About 8 in the Morning he went into the cold Bath again: About 10 *D. Hartley* went away, leaving it as his Opinion, that the cold Bath and Bleeding should be freely repeated, as the Circumstances should require. About Noon *Fr. Sandys*, being hitherto detained by Business, came, and bled him immediately, to the Quantity of 18 or 20 Ounces: He continued all this Night restless. Upon *Fr. Sandys's* asking him whether his Aversion to drinking proceeded from any Pain in swallowing, or some other Cause? He said, it was from a Pain in swallowing. The next Morning his Strength not being at all diminished, and his Pulse continuing full as vigorous as ever, *Fr. Sandys* bled him again to the Quantity of 15 or 16 Ounces; yet he still remained the same, and took the same Care of his Horses as usual. *Fr. Sandys* went away, leaving Orders that as long as these Symptoms, *viz.* Restlessness, Strength, and Aversion to drinking continued, he should be bled freely, and put into the cold Bath. He was bled twice more within the Week, so that the whole Quantity which he lost in that time was about 120 Ounces. After the last bleeding his Symptoms disappeared, and he grew weak, low-spirited and sleepy: Then he went 8 times into the cold Bath. He did not take any Medicines during his whole Illness.

N. B. This Person has continued well ever since, *Anno* 1738.

Windfor, May 22, 1734.

XVII. 1. *Bartholomew Collins*, a Labourer in the King's Works at *Windfor*, of low Stature, pale Complexion, slender and active, aged about 36, temperate in his manner of living, had, for some Years, been afflicted at different times with wandering arthritic, colic, and nephritic Pains, none of which were periodical or constant. During this Term, when in best Health, he was usually costive, and his Urine, as soon as made, deposited a *calculous* Sediment.

Two Histories of Internal Cancers, and of what appeared upon Dissection, by William Bur-ton, M. D. No. 464. p. 99. Read May 13, 1742.

In *March* 1733, he received a violent Blow by a ponderous and obtuse Instrument on his Loins, together with the Spine of the *Os Innomina-tum*, towards the left Side, which disabled him for that Day; on the next, the Pain abating, he continued so well for 6 Months after, as not even to recollect this Accident, till about a Month before his Death, although he was often asked by the Physician, Whether that Part had ever suffered a Contusion?

In *Jan.* following, he complained of an excruciating Pain, extending from the aforesaid Spine to the spurious Ribs on the left Side, which sometimes attacked also the Intestines; whence he became continually restless, especially in the Night, and, tossing the Bedcloaths off, frequently lay naked. He could not lie upon his Back or left, *viz.* the

affected Side, but lay always on his right Side, leaning on his right Elbow. In April 1734, his left Knee, from a Contraction of the Muscles elevating it, was always drawn up towards the *Abdomen*, inso-much that he could not stand upright. His left *Testicle*, formerly less than the right, was now become scirrhus, and increased to double the Magnitude of this, and the left spermatic Vessels felt like a knotty Chord. A sort of hectic Fever attended him, the Exacerbation of which, as well as of his Pains, was generally about Noon, and 6 in the Evening. He had no Sleep of Nights without a Paregoric. Though his Appetite failed him, he had no Propensity to vomit, nor complained of Thirst. His Respiration and Urine were not amiss. His Pains were always exasperated by the Use of heating Medicines; and whenever the Pain seized the Intestines, terebinthinate Clysters increased them, whereas emollient and refrigerating ones mitigated them; by the Use of which he had daily one or two Stools. The Fæces were of a middling Consistence, lightly tinged with Bile. The Blood frequently taken away by *V. S.* in small Quantities, had always a thick, tough, fizy Buff-like pleuritic Coat; and at first, from each several Bleeding, he found Relief.

Jan. 4, 1733-4, the Apothecary first administered to him, for the Colic, *Elect. Lenitiv. & Pulv. Diasen. Ol. Junip.* and emollient Clysters. Three Days after, Pains seizing his left Side, and the *Sphincter Vesicae*, they were removed by repeated Bleedings, and *Decoct. Hord. & Lap. Prunel.* and *Syr. Althææ*. On the 12th, he complained of a Heat about the *Regio Pubis*, with Costiveness; but by the Use of *Sal. Mirab. Glaub. Lap. Prunel. Manna*, emollient Decoctions with *Sp. Nitr. d. & Elect. Lenitiv. pro re nata*, continued tolerably easy till the 24th, when the erratic Pains returning, and not yielding to the aforesaid Apozems, on the 26th the Physician first consulted gave him *Sperm. Cet. Sal. C. C. & pulv. e Chel.* and *Sp. C. C.* but these not availing, the *Lap. Prunel.* was sometimes interposed, and a *Calomel Bolus*, taken at Night, was worked off by a Sena Potion next Day: This Method, and afterwards Powders of *Lap. Prunel.* and *Cinnab. Antim.* taken in Honey, mitigated those Pains. But from Feb. 3, to April 4, sometimes nephritic Pains, intermitting Fever, pleuritic Pains, and Strangury, inordinately afflicted him, notwithstanding the Use, according to the said Indications of carminative, terebinthinate and saponaceous Clysters, Purges, *Sal. Absinth.* Draughts, repeated Bleedings, Vesicatories, the Powders and Electuary above-mentioned, Opiats, *Cort. Peruv.* in an Electuary, and infused in Wine, *Lac Sulph.* with Asses Milk, *Cinnab. Antim. Millep. Gum Guaiac.* and *Pulv. e Chel.* with *Vinum Milleped.* and *Sp. Nitr. d.* On March 20th, *Calomel. gr. v.* were given for 4 Nights successively, and afterwards purged off with a Sena Potion, and then continued again till the 28th, when he took another Potion. Paregorics were used now-and-then at Night, and *Ung. Opodeldoc* was applied to the *Testicle*.

April

April 4th, I first attended him in Consultation, when he complained of an intolerable Pain, upon any Pressure about the Region of the left Kidney; whereupon a maturing Cataplasm was applied in the Day-time, and a Plaster at Night. Emulsions, Whey, and such-like, were the chief Internals he used till April 8th, when crude Mercury was recommended to him, of which he took an Ounce Night and Morning, which gave so much Relief as to encourage the Continuance of that Medicine only to the 17th, when the Pains returning, he was bled once in 2 or 3 Days, to 4 or 5 Ounces, and treated with the subacid, cooling Regimen, and Paregorics, till April 29th, when he first mentioned a scirrhus Tumour, as big as a Hen's Egg, situated on the left Mastoid Muscle of the Neck. Upon comparing this with the *Testicle*, (neither of which Tumours were in the least diminished after Applications for that Purpose) it was conjectured, that either the Pancreas or Mesenteric Glands were cancerated. An Emetic of *Oxym. Scillit. farinaceous* Decoctions with Nitre, crude *Sal Armoniac*, *Oxym. Simp.* and *Diacod.* were of little or no Effect. Afterwards continuing the Use of Electuaries of *Conf. Ros. r. Elect. Lenitiv. Bals. Locatel. Æthiop. Min. Sperm. Cet. Ol. Amygd. d.* and the same with *Mercur. Alcalizat.* he became more and more emaciated, till May 21st, the Day of his Death.

It was remarkable, that every new Medicine, except it was very heating, afforded some Relief for 2 or 3 Days.

May 22d, on removing the Integuments of the *Abdomen*, the *Musculi Recti* appeared livid. The *Omentum* was destitute of Fat. The *Intestine* contiguous to the left *Os Innominatum* was tinged with Green. Nothing besides appeared morbid in the *Viscera in Situ* at first View. The Situation of the *Pylorus* seemed lower than usual. The Colour or Texture of the Liver were not remarkably preternatural. The Spleen was of the larger Size, and adhered in it's hinder Part so strongly to the *Peritonæum*, that it could not be separated without Laceration. Whereupon there remained in the Place of Adhesion, a thick, callous, and almost horny Membrane, as big as an Half-crown. The *Pancreas* was very small, and seemed composed of small *Scirrhi*. The left Kidney was twice as big as the right, or as it's own natural Magnitude: It's Substance about the *Pelvis* was corroded by a semipurulent cancerous Sanies, that was in part collected between the Surface of the Kidney and it's containing Bag. The internal Structure of it was not much amiss: But the *Fomes Morbi*, the most singular and surprising *Phænomenon* in this Subject, was a Number of large conglobate, steatomatous, cancerated Glands, reaching from the *Receptaculum Chyli* to the lowest *Vertebræ* of the Loins, so connected together as to represent a *Pancreas* affixed to the *Vertebræ* of the Loins, and upper anterior Part of the left *Psoas* Muscle: It was 4 times as large as his *Pancreas*, and as big as the right or sound Kidney. The *Aorta descendens* pervaded the Middle of this preternatural Substance Lengthways. From this Mass, as a Fountain, flowed that cancerous Sanies, which had made it's way to

the left Kidney, and also corroded the superior carneous Part of the left *Psoas major*, and *Iliacus internus*, so that one might easily rend their gangrened Flesh like rotten Linnen. Some of this green *Ichor* collected near the *Os Innominatum* had laid the Spine of it quite bare. The left spermatic Vessels were knotty, tumefied, and livid. The mesenteric Glands were scirrhous. The descending Trunk of the *Aorta* was smaller than usual; and, dividing it, we extracted a small *Polypus*. The Examination of the other Cavities was not permitted.

Jan. 11, 1735 6.

2. *Thomas Trinder*, a Taylor, living at *Windsor*, in his 29th Year, was of a pale Complexion, with red Hair, of a middle Stature, and thin Habit, addicted to smoaking from Morning to Night, and now-and-then to hard drinking. Eight Years before his Death, he was thrown in Wrestling, so as to pitch the Small of his Back upon the Corner of a Chair, by which at first he was much hurt in that Part; but upon the Abatement of his Pain, he became from that time subject to Fits of the Colic, in which he said his Bowels seemed to be drawn to his Backbone, and usually received Ease by binding his Waist as tight as he could. He had also frequent Recourse to Geneva and such Liquors for Relief, but seldom found any, till a Swelling, as big as a Hen's Egg, appeared like a Rupture in his right Groin. These Fits were not of above 24 Hours Duration, but the inguinal Tumour lasted 2 or 3 Days. He was often afflicted with Stitches under his left Breast, which were removed by Bleeding.

But in the Middle of *Nov.* 1735, his Cholic became so violent, that he could not lie in his Bed, nor sleep without Opiats. *Nov.* 21, I found him in the Use of some carminative Pills sent by an Apothecary. He had frequent Reachings to vomit, and was very costive. His Pains seemed confined to the intestinal Region, and were most acute in the Evening, continuing to harrafs him till 5 or 6 in the Morning. His Pulse beat seldom under 100 in a Minute, at Night generally above. He was not very hot, nor thirsty. His Urine at this time was rather defective in Quantity, than amiss in respect of Colour or Separation. His Tongue was foul towards the Root, but not very white. Upon his taking *Ipecacuan.* ʒss. and after it's Operation a *Sal. Absinth. Draught*, with *Syr.* and *Tinct. Rhabarb.* $\overline{a}$ ʒij, and the plentiful Use of *Infus. Sem. Lini*, Barley-water, Broths, and Clysters of Whey, Oil, and Honey, his Reachings ceased, and the Pains descended from the *Epigastrium* to the *Hypogastrium*. On *Nov.* 24th, a Potion of *Tinct. Rhabarb. cum Vino* ʒiij. *Elix. pp. Helm.* ʒj. *Sal. Absinth.* ʒss. and two purgative Clysters, one of which had *Terebinth.* ʒss *cum Vitel. Ov.* not procuring a Stool, he took a Bolus of *Calomel* ʒss & *Camphor.* gr. xij. *b. f.* and the next Day his Pains continued, though he had several Dejections from the Cathartic. Bleeding was omitted hitherto, because he had ʒx. of Blood taken away a Week before this Paroxysm; but now, upon

upon losing so much Blood more, he found immediate Relief. His Blood was very fizy.

After this, his Disorder resembled a nephritic One, his chief Complaint being of Pain about the Region of the Kidnies, and along the Descent of the Ureters. From Nov. 26th, upon the Use of an oily *Linctus* and *Manna*, *Sal. Absinth.* Draughts and Nitre, Clysters as well as Drinks of Whey and Honey, with Paregorics, and repeated Bleeding, the Pain, removing from the Loins, fixed itself at the *Os Pubis*, and in the Thighs, November 29, but by the Use of Emulsions with Gum Arabic and Nitre, the Pain about the *Pubis* abated, and mostly afflicted the left Thigh and Hip. From this time he generally sat up in his Bed, leaning forward to the left, and for the most part cross-legged, finding himself easiest in this Posture. He could not lie any time on his right Side. The Quantity, Colour, and Sediment of his Urine, were much the same now as when he was in Health. It was made without the Pain, which, soon after the nephritic Symptoms commenced, he complained of at the Root of the *Penis*. And now his Disorder resembled the *Lumbago* and *Sciatica*, affecting the left Side mostly: Whereupon Dec. 2, he was put in the Use of a diuretic and aperient Electuary, with *Terebinthinate* Clysters. To this Time he had very few Stools without Clysters, and those generally very small and fetid. Dec. 5, the Fever and Pain increasing, a cooling aperient Apozem, with a paregoric Draught *pro re nata*, were continued till Dec. 9, when examining the Thigh where the Pain now afflicted him most, I found some small *Scirrhi* in the Groin, which were sensible enough to the Touch, though not to the Sight; and from that Time, apprehending him of a scrophulous Habit, prescribed as follows: *R Myrrh. Milleped. Suc. Glycyrrhiz. Terebinth. Venet. Pil. Matth. a ʒj. Balf. Gilead. ʒss Dia-cod. q. s. f. Pilule N^o xx. Capiat ij tertiis horis cum Sero Lactis*, which giving Relief, were repeated, only exchanging *Pil. Matth. gr. viij.* for *Ol. Anis. gr^{ss} v.* and continued to Dec 12, when his Pains returned violently, and he coughed up clotted Matter, not unlike the *Parenchyma* of the Lungs abraded, with a little Blood. His Breath became fetid, his Respiration troubled, and he complained of Thirst. He used oily paregoric Draughts to the 15th, about which Time he was seized with so violent a pleuritic Pain in the Middle of the Night, that it was thought he must have expired, had not about ʒx of Blood been taken away immediately, upon which the Pain soon removed from the Side, and attacked him there but for a few Minutes afterwards. The Blood continued as fizy as ever. In the Evenings, when his Pains were most vehement, he had been sometimes delirious.

Dec. 18, he first told me of a Tumour he had discovered near the Navel, since I saw him on the 15th. It appeared not as he sat, but when laid on his Back, there was a Protuberance bigger than a Turkey's Egg, 4 Finger's Breadth on the left Side of the Navel, extending 2 above it, and 4 below it. By it's Situation, Resistance to Pressure, and

and the Unevenness that from under the Skin was communicated to the Touch, it's disappearing when he was in an erect Posture, and it's not being diminished by discutient Fomentations, it was judged to be a scirrhus Tumour, which had long existed there unobserved by the Patient, till it increased too much to be longer undiscovered. The *Emplast. de Ran. & cum Mercur.* was applied outwardly; and concluding there was an internal Cancer, I was encouraged, from the preceding Case, to order him *Hydrargyr. ʒj* every Morning. Whereupon there was such a Remission of his Pains, that during almost a Fortnight, he got more Rest without Opiats than before with them; insomuch that being greatly revived, and regaining some Appetite, he got down Stairs 2 or 3 times. Thinking the Plaster increased his Pain, Indigo blue Linnen was applied in it's room. The Mercury came away by Stool, and he had now one almost every Day, and sometimes twice a Day, without a Clyster. His chief Drink was Milk and warm Water. His grand Complaint now was of a most troublesome *Cardialgia*, especially when he lay down, which was somewhat mitigated by Powders of *Cret. Britan. cum pauxillo Sal. Absinth.* From the first Use of the Mercury he seemed on the mending Hand, till after about 12 Days, when omitting it for a few Days, he relapsed into his former or a worse Condition; and though he was somewhat easier on the Repetition of it, the good Effects lasted not long. He drooped daily from Jan. 4, and on the 13th died, emaciated and almost *exanguis*.

Upon Dissection, nothing preternatural appeared in the Integuments, abdominal Muscles, or *Peritonæum* immediately under them. But under all these, where the Protuberance had been observed, and immediately under the *Omentum*, (which was destitute of Fat, and it's lower Part was mortified) there came in View an anomalous Substance *in Situ*, seemingly as big as a very large Potatoe; which, when the circumambient *Viscera* were removed, was found to be a scirrhus, fungous, cancerated Excrescence, rooted, as it were, to the left Side of the *Vertebrae*, quite from the *Diaphragm* down to the *Pelvis*, of a monstrous Bulk, occupying near $\frac{1}{2}$ of the *Abdomen*, lying like a Tortoise with it's Head towards the *Pelvis*, and it's Back to the *Umbilicus*. It was in the upper Part covered by and firmly cohered with the *Colon*, which in the whole Contiguity was black and mortified. It was strongly attached to the *Peritonæum* on the left Side of the *Lumbar Vertebrae*, having displaced the left Kidney, and brought it forwards to the left Side of the Navel, so that it came in View as soon as the *Omentum* was removed. It likewise removed the *Aorta descendens*, the left Emulgent, and Meseraic Vessels, quite out of their natural Situation; all of which were found pervading the Centre, nearly, of this Excrescence, and smaller than natural. It adhered to the Kidney strongly where the emulgent Vessels enter it, and it had detruded most of the small Guts into the *Pelvis*. Nothing was preternatural in the Stomach or Spleen, excepting that the latter, as well as the left Kidney, seemed paler than usual,

usual, and this Kidney also more flaccid : The Gall-Bladder was shrunk to the Size of a Nutmeg, and empty. The Liver had a preternatural Lobule, as big as a Hazel-nut, adhering to it by a small Pedicle. But otherwise all these *Viscera*, as well as the right Kidney, Bladder, &c. discovered nothing morbid.

This cancerated Excrescence could not be eradicated without Laceration, and upon the Removal of it, 2 or 3 large Trunks of Nerves appeared naked, passing over the *Iliacus internus* to the Thigh, which had been compressed by this Tumour. The Weight of this Excrescence was $\text{lbiv} + \text{xxiv}$; and allowing for what remained upon Laceration, and the Effusion upon cutting into it, it doubtless exceeded lbv . Upon Bisection, it appeared to the Depth $\frac{1}{2}$ Inch from it's Surface black and gangrened, and, below that, it was all spongy, with Cavities as large as those of an Honeycomb; and from it had issued a cancerous Sanies, draining to the *Pelvis*.

Upon opening the *Thorax*, the right Lobe of the Lungs was full of scirrhus cancerated Tubercles, from whence a Sanies had flowed betwixt it and the *Pleura* : The left Lobe was much smaller than the right, firmly attached to the *Pleura* and *Mediastinum*, and inseparable without Dilaceration. It had some Tubercles also. The Heart appeared sound, but a large *Polypus* was taken out of it's right Ventricle, at the Orifice of the *Arteria Pulmonalis*.

Another Case occurred to me contemporary with the first of these, and so like to both of them in the antecedent Cause and Symptoms, that, could I have obtained Leave to inspect the Corpse, I am persuaded some such immediate Cause would have discovered itself. Crude Mercury was the only Medicine in this Case also, that palliated for about 10 Days successively.

The Diagnostics of a Cancer within the *Abdomen*, deduced from the preceding Histories, seem to be as follows :

A naturally slender Habit of Body, accompanied with some scrophulous or scirrhus Tumour, together with a pale Complexion, and costive Disposition : If such an one, at an Age above 20, has received a violent Contusion on the Loins, and, neglecting all Remedies, is some time afterwards attacked with excessive Pains, afflicting now the *Colon*, then the urinary Passages, Spine of the *Os Innominatum*, and *Pubes*, at various times, always increased by all Internals or Externals, by which the Heat of the Body is increased, especially *Terebinthinate* Clysters; but mitigated by some Singularity of Posture, in which the Patient constantly abides; if these be attended with an hectic Fever, without the usual Degree of Heat in the Skin, of Whiteness or Dryness of Tongue, or Complaint of Thirst, and also without Cough, high-coloured Urine, or vitiated Respiration; if accompanied likewise with an Affection of the spermatic Vessels of the Thighs, and frequent pleuritic Pains; the Blood always abounding with tough Size; if Opiats soon lose their Effect, and only (as all other new Remedies not heating) seem

seem to give Relief for 2 or 3 Days ; if Cathartics take place, and by frequent Repetition do not produce a colliquative *Diarrhœa*, and the most palliative Remedies are nitrous Salts and Mercurial ; may it not be concluded with much Probability, that such a Case is owing to some such Cause ? May it not be pronounced an internal Cancer ?

Various Medico-Chirurgical Observations, by Jo. Dan. Schlichting, Med. & Chir. Doct. Acad. Cæsareo-Leopold, &c. No. 466. p. 270. Read Dec. 23. 1642.

Some late Discoveries concerning the Spina Ventosa.

XVIII. I have observed the *Spina Ventosa* to be very like the Venereal Disease, and to corrupt the Humours and Vessels of the Body. It does not always first affect the Bones or Marrow ; but sometimes the Fat, Membranes, and at last the Bones themselves. The *Periosteum*, and other ambient Parts, sometimes only appear tumefied, and upon their being cut away, the Bone does not seem infected. In some the Bone swells first in the *Epiphysis* ; and sometimes one or more of the Bones of the Fingers swell all over. When I have found a Bone carious, I have also perceived Ulcers, Fistulas, Knots in the Buttocks and under the Arm-pits, and the Eyes, and other Parts, either inflamed or exulcerated. These Symptoms yield only to Mercury, which is the peculiar Remedy, for this and the Venereal Disease.

Abscesses and Ulcers have sometimes penetrated to the very *Periosteum* and Ligament, and yet no *Caries* could be seen. Sometimes the Bone appears naked, without any *Caries* ; sometimes with a *Caries*, but without any *Exostosis* ; and sometimes there is an *Exostosis*, without either Nakedness or *Caries*. After a Suppuration, the *Exostosis* is afterwards much resolved, by the Use of a proper Remedy. Nay upon a Separation of some Particles of the Bones, the rest of the osseous Tumour is gradually dissolved.

Patients may have a Joint or two taken off, and yet be not quite freed from the Disease : The subtile venemous Matter remains, and afterwards shews itself in it's former Shape in other Places. Therefore in such a populous City as this of *Amsterdam*, it is very wrong to leave such miserable Objects to Nature alone, for 10 Years or more, in vain Hopes of spontaneous Relief : For instead of being cured, they waste away in a most miserable Manner.

Having in vain tormented these Wretches for a long time with Decoctions of the Woods, Catharticks, Sudorificks, Diureticks, Earths, Æthiops Mineral, and Steel, I tried Mercury, and found it to answer my Purpose, especially when applied externally to the Part affected ; tho' I have often found it efficacious, when given by the Mouth. In whatsoever Condition the Swelling is, whether covered with Skin or exulcerated, either with or without a Nakedness or *Caries* of the Bone, I order it to be anointed with a *Neapolitan Ointment* : *R. Ung. Ros. ʒj Merc. viv. ʒss. Terebintb. clar. ʒj M. F. Ung.* to be used thrice every Day, for 8, 10, or 14 Days, according to the Age of the Patient, laying a defensive Plaster over it. It may be afterwards continued once or twice a Day, for 2 or 3 Months or longer, giving a purging Medicine between whiles, to keep off a Salivation, which cannot be continued long enough to subdue this, as it does the Venereal Disease.

Disease. The Inunction must sometimes be suspended also, because the Cure of this Disease is slow, and it must be proceeded with at times, till all the Ulcers are healed, and the osseous Tumours in a great Measure disappear.

By this Method alone I have generally seen Tumours resolved; and even deep Ulcers, so putrid and fungous, as to be like Fistulas, quite consolidated, without any cutting. But when I have found this Method continued without Success for some Weeks, when Pus, Ichor, or Lymph is pent up, or some Fragment of a corrupted Bone cannot be separated, I have ordered the Part to be cut, and dilated with Sponge or Lint, applying afterwards to the Wound Tincture of Myrrh or Euphorbium, *Aq. dir. Fernel. Ung. fus. Fel. W.* Alum, either crude or burnt, *Merc. præcip. & dulc.* Spirit of Turpentine, and such like Medicines, to cleanse the sordid Ulcers, eat down the fungous Flesh, and heal that which is wounded, not omitting the Use of a Bandage. As for the Tumour of the consolidated Part, I generally leave it to Nature to discuss, or only apply a gummous Plaster to it.

A Girl 3 Years old had a Pleurisy, which turned to an internal Abscess, attended by an Asthma for some Months. But on a sudden a Discharge of Matter flowed thro' the *Vulva*, which continued almost without Interruption, Day and Night, for almost 4 Months, so that her Thighs were quite raw. After this, she perfectly recovered; and tho' it is 5 Years ago, she has hitherto enjoyed a perfect State of Health

A suppurated Pleurisy discharged thro' the Vulva of a Girl.

A young married Woman had a Tumour in her Spleen 6 Years ago, upon the disappearing of which, she had a plentiful Discharge of Matter by the *Vulva*, upon which she perfectly recovered, and has continued in a perfect State of Health ever since.

An Abscess of the Spleen cured by a Discharge of Matter thro' the Vulva.

A young Man of 26, had a virulent *Gonorrhœa* 4 Years ago, for which he used not only purging Medicines, but also very strong Diureticks, for the Space of a Year; and at last began to emit Blood instead of *Semen*. It was of a blackish red, and he had no Flux from the *Urethra*, but in the time of Coition or Pollution. Nay tho' he totally abstained from this Evacuation for a Week, or even for several Months, yet after this Abstinence he constantly discharged Blood. To this very time he has never discharged any pure *Semen*, and very seldom any thing white, like Seed, mixt with the red. I prescribed him very strong astringent and attemperating Medicines, both internally and externally, which have brought the dark red Discharge to be a little whitish. Afterwards I put him into a Salivation for a pretty long time, and gave him other Medicines, but all to no Purpose. He was therefore declared incurable, and to be left wholly to Nature. It may deserve to be inquired, whether any Blood-vessel is bursten, and not yet consolidated, in the *Prostate*, or one of the *Vesiculæ Seminales*.

A Discharge of Blood in Coitu, instead of Semen.

*A Suppuration
of the Joint of
the Hip, with
a coming away
of the Head of
the Femur,
consolidated.*

A young Country Girl of 14, in 1730, had a painful Swelling on the Joint of her Hip, which suppurated and burst. The Surgeon dilated the Opening made by Nature, and extracted the whole Head of the *Os Femoris*. He put Tincture of Myrrh into the Cavity, and *Ung. fuscum fel. W.* He made a very tight Bandage, which he seldom took off; and in 6 Weeks time it was consolidated, and the Girl was able to walk, tho' not without halting.

Fig. 114.

Fig. 114. 1. represents the *Acetabulum* of the *Os Innominatum*. 2. The Head of the Bone extracted from the Ulcer. 3. The Neck of the Bone, &c.

*A false Aneurism, without
Pulsation, con-
taining liquid
Blood.*

In 1741, I had a Consultation with the Surgeons about a Woman, whose right Arm was swoln about the Elbow to the Thickness of 32 Inches, occasioned by a Bleeding a Year before. It was now inflamed, red, and full of Pain. The Tumour was extended from the lower Part of the *Humerus* almost to the Wrist. On the inner Side there appeared a small, livid, gangrenous Ulcer. It felt like a Bladder full of Liquor, tight, without any Pulsation, and so hard and dense, as not to yield in the least to any Pressure. There was no Pulsation to be felt in the Wrist. Some thought an adipose *Fungus* was inclosed; but others agreed with me, that it was an Aneurism without Pulsation. We therefore agreed to make convenient Bandages about the Arm, and wait for it's bursting, which happened on the third Day afterwards; when upon loosening the Ligature, the liquid Blood, in the Quantity of above a Pound, burst out in a moment, with very great Violence. The Surgeon immediately stopped the *Hæmorrhage* with Powder of Puff balls and Bandages. Two Hours afterwards we all agreed, that either the Arm must be taken off, or the Artery tied up. We chose the latter, and having first applied the Turniquet, we cut the Skin, Fat, and Belly of the *Biceps*, above the Aneurism, in the sound Part, almost in the Middle of the Arm, and passing a Needle and Thread under the Artery tied it fast. Then, upon opening the Aneurism both upwards and downwards, clear red liquid Blood flowed out on a sudden, to the Quantity of 4 Pound. Here was no Bag found in the Artery, as in a true Aneurism, nor any *Polypus* or grumous Blood, as in a false one, but quite another Cavity formed between the Skin and the Muscles, and between the Muscles themselves; and all the Muscles of the lower Part of the Arm were separated, as if it had been done by Art; but they were pale and flabby, with a little Gelly, like a soft *Mucus*, sticking to them, which I wiped off with my Fingers, and upon washing found it to be white. In the above-mentioned Cavity, we were all surprised to see the Blood burst out copiously, in 6 or 7 Places, above, below, and from the Sides, as from so many Channels. We applied very strong Stypticks to them, with Puff-balls, Vitriol, Spirit of Turpentine, *Alcohol Vini*, &c. with which being laid upon Lint, we filled the whole Cavity, applying adhesive Plasters, and tight Bandages. The Flux of Blood was thus soon stopped, but other bad
Symptoms

Symptoms increased toward Evening, such as Fever, Eructations, Nausea, Vomiting, Hiccups, Faintings, Catchings of the Tendons, &c. The next Day the Symptoms increased, and she grew delirious. On the 3d, notwithstanding a plentiful Use of Attemperants, Anodynes, and Cordials, she died.

Fig. 115. 1. represents the inner Side of the right Arm, with the Aneurism. 2. The Place where the Blood burst out spontaneously. 3. The outer Side of the same Arm.

XIX. Whatsoever obstructs the lymphatic Vessels, in such a manner, as to obstruct the Passage of the Lymph to the Heart, may cause a Dropsy. Thus when the Head is too much pressed in a difficult Birth, or when the Head is already born, if the *Os Uteri* presses the Neck and jugular Vessels, so as to hinder the Return of the Blood thro' the vertebral Arteries, a *Hydrocephalus* may be formed.

Two Anatomico-practical Observations, by Job Baister, M. D. F. R. S. No. 466. p. 277. Read Dec. 23, 1742.

Thus *Lower* tied the Jugulars of a Dog, leaving the Arteries free, and found the Head to swell gradually, and the Dog himself to grow hydropical: And I have often observed myself, in the Dissection of several executed Bodies, that, the Return of the Blood from the Head being obstructed by the Halter, the Cavities of the Brain are filled with an aqueous Moisture, and the *Plexus Choroïdes* abounds with Hydatids.

A *Hydrocephalus* also arises, when Children are born with their Necks bent, or are too roughly handled by Midwives, or pitch their Heads downwards in the Womb before the due Time. It is also much forwarded by a phlegmatic Constitution of the Mother, and her feeding on a crude Diet, or difficult of Digestion.

Since in every Point of the Body there are Veins, which carry a Lymph thinner than the Blood, a Dropsy may arise in any Part of the Body; if it is universal, it is called an *Anasarca*; if particular, it obtains it's Name from the Parts affected; as a *Hydrocephalus*, or Dropsy of the Head, a Dropsy of the Breast, Womb, Ovary, *Scrotum*, &c.

But as I have this Year had an Opportunity of observing in my Practice a very rare Instance of a *Hydrocephalus*, and a *Saccular Dropsy*, if I may be allowed the Expression, I shall desire leave to offer an exact Description of them to the Royal Society.

The first Case was of a Male Infant, that had a Bag rising on the *Os Sacrum*, and hanging down to the Heels, a true Production of the Skin, seeming to the Touch as if full of an aqueous Humour. This Infant, tho' his fresh Colour pronounced him to be in a good State of Health, lived but a few Days. I was not allowed to open him, but I had his Picture taken, with an exact Mensuration of all his Parts, by an accurate Painter.

Of a Child born with a Bag full of Water, reaching from the Os Sacrum down to the Heels.

The other Child was 2½ Years old the very Day he died, in all which time he took no other Sustainance than his Mother's Milk. His Father was a very healthy Man; but his Mother was a sickly Woman. He was born with a Head somewhat larger than usual, which gradually increased

A remarkable Hydrocephalus.

creased to an extraordinary Bigness, tho' his Parents had consulted several Physicians and Surgeons, and had tried various Remedies, but in vain; so that he had not Strength to support this monstrous Head, but was always forced to lie down.

The Head being measured after Death, was found to be 20½ Rhinland Inches, from the right *Meatus Auditorius* over the *Offa Bregmatis* to the left *Meatus*; 20 Inches from the Root of the Nose to the first *Vertebræ* of the Back; and above 25 from the Root of the Nose round the Bones of the *Occiput*, Forehead, and Temples. Thus the Bones of this Head were stretcht from one another; and yet no *Serum* or Water was found between the common Integuments.

Upon opening the Skull and carefully raising the *Dura Mater*, the *Pia Mater* appeared, but very tender and transparent, and filled with an aqueous Liquor, without Smell or Taste, but so clear, that we could see through it to the Bottom of the Skull: For the Substance of the Brain was so compressed, that it seemed to be nothing less than a Brain, but only a strong Membrane, thicker in some Places and thinner in others.

The 3 Cavities of the Brain formed but one Cavity, in which were the *Medulla Oblongata* and *Cerebellum*, but incredibly small. Neither the *Nates*, *Testes*, *Anus*, or *Vulva* of the Brain, nor any of it's Protuberances could be found, or the least Traces of them.

The Liquor contained being carefully poured out filled 5 Pints, and weighed lbvj. 3xj.

This Child did not discover any animal Actions, but only vital: He was very quiet, never cried, seemed as if always asleep, and died without any Convulsion, or sensible Motion.

An extraordinary Tumour on the Thigh, by Mr Mizael Malfalguerat, Surgeon, at St Edmund's-Bury. No. 456. p. 365. Jan. &c. 1740.

XX. Grace Lowdell, a poor Woman, 60 Years of Age, of the Parish of St James, in Bury St Edmund's, Suffolk, being naturally of a gross, fat, and relaxed Constitution, and constantly given to the drinking of strong Liquors; and consequently labouring for many Years under an ill Habit of Body, such as the Rheumatism, which had caused Contraction of some of her Fingers, with some nervous Affections in her Head, often causing some little Fits of Vertigo, &c. And though she had formerly a *Procidentia Uteri*, yet there could not be found any other scrophulous Symptoms, than that she observed, when about 30 Years of Age, soon after her Delivery of a Son, a little hard Swelling on the Muscle *Biceps*, and posterior, inferior, and external lateral Part of the Thigh, a little above the Ham, without her knowing any manifest Occasion for it; which at first went on slowly, but after proceeding more quickly, and the older it grew, it still came on the faster, until it increased to the Bulk of near a Foot in Circumference, being somewhat of a globulous and a little longish Figure from it's Basis, which was lax, like a Peduncle, or Stalk, and about half the Circumference of the Tumour, like a Neck to the Head of a Child hanging down.

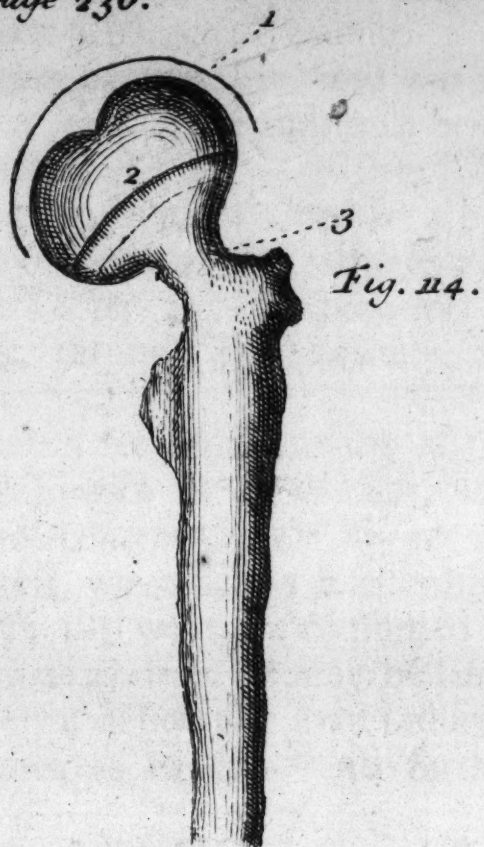


Fig. 114.

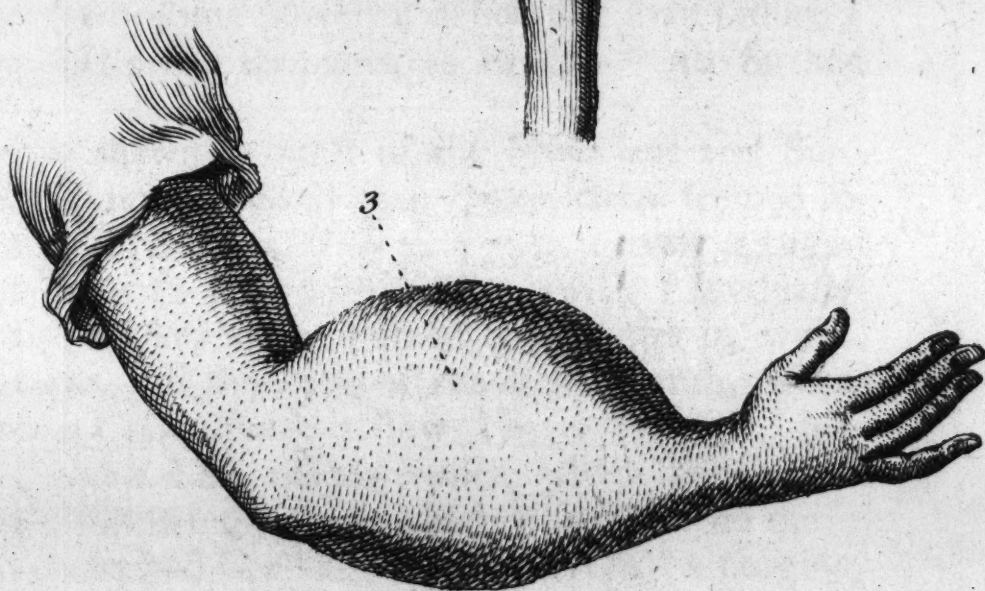
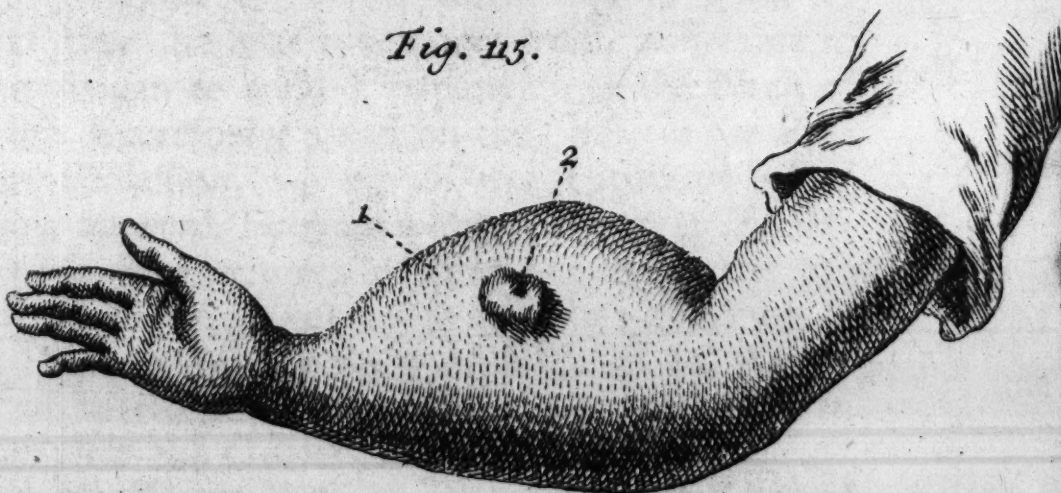


Fig. 115.



From the first Appearance of this Tumour to the Excision of it, there were more than 30 Years: She had excessive Pains and Uneasiness in it, and at last it's Bulk and Weight had in some measure intercepted the Nourishment to it, so that an Ulcer had affected the inferior Part of it, very putrid and sinuous, of about 6 Months standing.

This Excrescence was of the natural Colour of the Skin, and was for the most Part of a pinguedinous Substance; the Centre and Basis being an *Atheroma*, but more scirrhus than common.

This Excrescence, having grown so big, was not contained in a manifest *Cystis*, but had some large Circumvolutions of Fat adherent to it's common Teguments, as was observed after the Excision of it, when it was soon conveyed away; so that, through Inadvertency, we did not weigh it.

My Design in this Case was to have made a total Extirpation of this Excrescence; but by reason of it's lying with large Vessels, and amongst the Tendons of the Muscles, I was content (as Dr *Turner* advises in such Cases) "To level it, the best we can, by Escharotics, " still repeated as the Sloughs throw off; till we have consumed as " much of the Gland or Substance, and gone as deep, as may be safely " adventured; when probably some powerful desiccative may induce a " *Cicatrix*, which may so tie the Remains, as to create no farther " Trouble."

This Tumour had been shewn to most of the Physicians and Surgeons hereabouts, some of no less Skill than Note, who seemed to approve of the Operation: Therefore, *July 7, 1735*, I made a Ligature about the Basis of it, with a Slip-knot, by which I gradually constricted it once or twice a Day, as the Patient could suffer it, without causing any ill Symptoms, till the 17th of the same Month, when she was taken with strong Convulsions, a slow Fever, Syncope, her Teeth set in her Head, and a Loss of her Senses, which lasted that whole Day, and the Night following; from which time I did no more constrict the Tumour, prescribed Cordials, volatile Drops, a purging *Enema*, and a paregoric Draught at Night, which had so good an Effect, that by the next Day she was much recovered, and came to her Senses. The Ligature began to make a Separation in the Neck of this preternatural sprouting Excrescence; and on the 20th, in the Presence only of one in the Profession, having all my Apparatus before me, I extirpated the whole outward Tumour without any great *Hæmorrhage*. I was induced to use the Ligature, in order to prevent the too great Effusion of Blood, which might otherwise happen; thinking it not very safe to make a Ligature of the Body of so large an Artery as in the Ham, for fear of intercepting afterwards the Nourishment to the Leg, as happens often after the Operation of the *Aneurisma*.

The Remains, though sordid at first, by a peculiar Method of Dressing, and proper Applications of strong Digestives, Detergives, &c. cleansed, and the Ulcer soon digested, the Substance came even to the Skin,

*The Case of
Mary Howell,
who had a
Needle run into
her Arm, and
came out at
her Breast.
No. 461. P.
767. Aug.
Etc. 1741.*

Skin, and, Sept. 21, it was all perfectly cured, without any Hardness or any Inconvenience to her walking, and is like to remain always so.

XXI. *Mary Howell*, late of *Oswaldestry* in *Shropshire*, Spinster, *March 3, 1732*, had stuck a small Needle upon the Sleeve of her Gown, which by her accidentally running against a Door, she drove, with some Thread twisted about it, into her left Arm, about 6 Inches below her Shoulder; and a young Woman, endeavouring to draw out the said Needle, broke off the Eye thereof, and left the Needle in her Arm: Upon which she directly applied to *Mr Tomkins*, a Surgeon, in the same Town, who endeavoured to extract it, but could not, without laying her Arm open, which she would not suffer. About a Month after which she felt a gnawing Pain above the Place where the Needle ran in, and up to her left Shoulder, which lasted her 3 or 4 Days, and so returned by Fits, till at length (about 17 Weeks ago) she felt a gnawing Pain (she thought) at her Stomach, which made her very sick, and reaching to Vomit, and continued to afflict her (especially in the Mornings) till about the *Sunday after Easter* last; in the Evening of which Day she fancied a Pin was got into her right Breast, in the under Part; and 2 Days after applied to *Mr Robert Nanney*, Surgeon, in *Fetter-lane*, who the same Day lanced her Breast, and extracted the same Needle, as she verily believes, as having no Eye, but the Thread still twisted round it. This Needle, about an Inch long, without an Eye, and with Thread still twisted about it, she produced before several; and she saith, that from the Time of the said Needle being so drawn forth, she never had any Return of Pain in her Breast, Stomach, Shoulder, or Arm.

London, June 2, 1739.

*Concerning a
Man who
lived eighteen
Years on Wa-
ter, by Mr
Robert Camp-
bell of Ker-
nan. No. 466.
p. 240. Read
Dec. 9, 1742.*

XXII. *John Ferguison*, a Native of the Paroch of *Killmellfoord*, in the Shire of *Argyle*, about 18 Years ago happened to overheat himself on the Mountains, in Pursuit of Cattle, and in that Condition drank excessively of cold Water from a Rivulet, near by which he fell asleep; he awaked about 24 Hours after in a high Fever: During the *Paroxysm* of the Fever, and ever since that time, his Stomach loaths, and can retain, no kind of Aliment, except Water, or clarified Whey, which last he uses but seldom, there being no such thing to be had by Persons of his Condition in that Country for many Months in the Year.

Archibald Campbell of *Ineverliver*, to whom this Man's Father is Tenant, carried him to his own House, and locked him up in a Chamber for 20 Days, and supplied him himself with fresh Water, to no greater Quantity in a Day, than an ordinary Man would use for common Drink; and at the same time took particular Care, that it should not be possible for his Guest to supply himself with any other kind of Food without his Knowledge; yet after that Space of time, he found no Alteration in his Vigour or Visage.

He is now about 36 Years of Age, middle Stature, a fair and fresh Complexion, with a healthy (though not seemingly robust) fresh Com-

Complexion ; his Habit of Body is meagre, but in no remarkable Degree; his ordinary Employ is looking after Cattle, by which means he needs must travel 4 or 5 Miles a Day in that mountainous Country.

He uses no *Tobacco* ; yet seems to discharge as much *Saliva* as others, who do not use *Stimulus's* to provoke that Evacuation.

If we may judge of his insensible Perspiration by the Softness and Freshness of Skin, he is in that respect like other Men, and like them sweats with violent Exercise ; as to the grosser Excrements, it did not occur to me to inquire about them, but I conclude he discharges none ; because the Country People, who strongly fancy him supported by supernatural Means, would not forget to object this to him, if he evacuated any Quantity of gross *Fæces*, with which Water is not charged.

This History of this abstemious Person I had from Mr *Campbell* of *Ineverliver*, my Neighbour in that Country, who is a Gentleman of great Candour and Ingenuity, neither credulous himself, nor any ways inclined to impose upon the Credulity of others. I had the same Account from several others, and confirmed by the Belief of the whole Country. The Man himself I never saw, but the Bearer, Mr *Charles Campbell*, Preacher, has conversed with him, on whose Veracity you may depend.

The Case appears extraordinary singular, and worth the Notice of Men of Letters, is one Instance to convince us, that a great Part of the gross Meats which we greedily destroy, is not necessary for the Support of Animal Life ; and that there must be some other Qualities in the pure Element of Water, than what have fallen under common Observation, since they have supported this Man in Health and Vigour for so many Years, and supplied the Evacuations necessary in the Animal Economy.

Dec. 1, 1742.

XXIII. 1. I have transcribed a Case, which I received from a young Clergyman, who some time studied Physic, and knows the Woman : I shall probably see her at *Clogher*, where she now lives. The Case happened within these two Years, but I cannot learn the exact Date at present.

Concerning the Cæsarian Operation performed by an ignorant Butcher, by the Rev. Dean Copping, F. R. S. No. 461. p. 814.

Sarah M^{rs} Kinna, who now lives at *Brentram*, 2 Miles from the City of *Clogher*, in the County of *Tyrone*, was married at the Age of 16 Years. Before her Marriage she never had the Appearance peculiar to Women ; but, in a Month after her Marriage, those Appearances shewed themselves properly. Ten Months after her Marriage, she found the Symptoms of Pregnancy, and bore a Child at the Expiration of the usual Time. Ten Months after, she was delivered of another ; and each Time had a speedy and easy Delivery.

Two Months after her second Lying-in, Symptoms of Pregnancy appeared again, and increased in Proportion to the Time ; but at the End of 9 Months those Symptoms began to dwindle, and in a little time she had no other Reason for thinking she was with Child, but an absolute Stoppage of her *Catamenia* : Nor had she, during the Space of 6 Years.

Of the Cæsarian Operation performed by an ignorant Butcher.

6 Years and some Months, any one Return of them; but for the greatest Part of that Time, especially the 4 first Years, she was perpetually afflicted with most violent Pains in the middle Region of the *Abdomen*.

Some time in the 7th Year after her last Pregnancy, which ended in such an unusual Manner, a Swelling in her Belly, and other Symptoms, made her conclude she was again pregnant.

About 7 Months after this uncertain Account, a Boil, as she thought, appeared about $1\frac{1}{2}$ Inch higher than her Navel.

During this Time of her Pregnancy she often found the Symptoms of her being quick with Child, till about 6 Weeks before this Boil (as she calls it) appeared. It was attended with very great Pain.

She sent for one *Turlogh* [*Terence*] *O'Neill*, a Butcher, who then did, and does now live with Capt. *George Gledstanes*, about a Mile from *Clogher*. This Man came to her the *Sunday* after her Message, and found her in an expiring Condition. By this time the Impostumation (which she apprehended to be a Boil) had broken, and an Elbow of the Child had forced itself through it, and appeared in View. At the Request of herself and Friends, he undertook to administer Relief to her, and made so large an Incision above and below the Navel, as enabled him, by fixing his Fingers under the Jaw of the *Fætus*, to extract it; in which Operation he met not with the least Impediment. He afterwards looked into her Belly, and seeing something black, he put in his Hand, and extracted, by Pieces, a perfect Skeleton of a Child, and several Pieces of black putrefied Flesh. After the Operation, he swathed her up; and in 6 Weeks she pursued her domestic Business.

She has been in good Health ever since this wonderful Accident happened; only she has a Navel-Rupture, owing to the Ignorance of the Man in not applying a proper Bandage.

A further Account, by the same. Ibid. p. 816.

2. I have seen the Woman, of whom I sent you the surprising Account, with her Husband, and inquired more particularly into the Fact; but hope to be still a little more particular, when I see the Man who extracted the Child. They are so ignorant, that, with their bad Language, I could not make myself quite Master of what they said; but, if they speak true, there is something more surprising than the former Account mentioned: For the several Parts of the latter, or rather the former, *Fætus*, were extracting by Degrees, from *July* to *Christmas*.

She had, by their Account, been married about 8 or 10 Years before her first Pregnancy.

As well as I could apprehend them, she had a Midwife at the proper Time, in her first Pregnancy, for 8 Days, Day and Night: When the Symptoms disappeared, the Swelling decreased, and the People concluded there was no Child.

This Child was carried for 7 Years, till she had been again pregnant for 9 Months; about which Time there was a Swelling in her Navel about,

about the Bigness of a Goose-egg, which broke in a small Orifice, of itself, and discharged a watry Humour.

She had a Midwife, and 3 or 4 Physicians, who gave her over, and left her as a dying Woman. From this Orifice started the Elbow of a Child, which hung some Days by the Skin, visible to abundance : At length she cut it off for her own Relief.

When O Neile came, (whom I have not yet seen, but shall soon) she begged him to help her. The Man was frightened, and went to sleep; but, when he got up, gave her a large Draught of Sack, and, I suppose, took one himself; when he opened the Place, and made such a Hole as the Man describes to be as large as his Hat. He put in his Hand, took hold of the second Bone of the Child, and, pulling it backward and forward to loosen it, in a little time extracted the Child. After this, looking into the Hole, and seeing something black, he put in his Hand, and extracted other Bones. Some Bones still remained, which, as I said, were extracted at different times, it seems too in different ways; for some came by the Navel, others from the Womb the natural Way. She had great Pain at each time.

The former Account says, she pursued her domestic Business: She might be about the House, but she was 15 Months confined to the House. I have examined the Rupture, and can put a Finger a pretty Way up into the Body. Mr Dobbs, I hear, an eminent Surgeon at Dublin, thinks there may be Relief, and that the Rupture may be much helped, and the Guts reduced. I question whether he will think so, when he sees her.

XXIV. The inclosed is what I received this Day from a Gentleman who lives on the Spot. The Reason of the Child's being able to abide so long under Water is pretty evident: The Child, most likely, was infirm, weak, and sickly, from the Time of her Birth, so that the *Foramen Ovale* was not grown up. I remember about 3 Years ago to have seen a Subject, an old Woman 80 Years old, who had the *Foramen Ovale* so large, that you might easily thrust your middle Finger through it; but she was attended with the above-mentioned Circumstance, that is, she never enjoyed a Moment's Health in her Life.

Of a Girl three Years old, who remained a Quarter of an Hour under Water without drowning, by John Green, M. D. No. 454. p. 166. July, &c

May 16, 1737, Rebecca Yates, of Billson near Market-Bosworth in Leicestershire, had a Daughter about three Years of Age, that fell into the Mill-dam at the Head, near to the Mill-wheel; and, by the Force of the Stream, was drawn under the Water to the said Wheel, with her Legs forwards; one of her Legs went under the Mill wheel, and by reason of the Nearness of the Wheel to the Floor of it's Water-way, the Bulk of the Child's Leg stopped the said Wheel from moving at all. The sudden stopping of the Mill so much surprised the Miller, that he went immediately, and let down the Shuttle; but finding it would not go quite down, he came up again into the Mill, and looked both above and below, to see if he could not find out the Cause; then went and drew up the Shuttle, and let it down again; but as the Gate would not

1739. Dated S. alding, Feb. 18. 1737-8.

shut quite down, he could not as yet find out the Cause of his Mill standing still, for which Reason he went backwards and forwards betwixt the said Shuttle and Mill-room, as nigh as he can guess, 8 or 10 times, before he found out the Cause; but at last he drew the Shuttle quite up, by which means the Force of the Water drove the Child from under the Shuttle; then he put the Shuttle quite down, and thereby discovered the Child with her Leg under the Wheel, and lying upon her Face. The first Word she spoke was, *Help me*, which she repeated three times; the Miller left her Arm for some other Person to hold her, whilst he endeavoured to remove the Wheel, so as to get out her Leg; and then she said again, *For God's Sake help me out, if you can*. She spoke very briskly, after she was put to Bed. But the Mill-wheel had tore away all the Skin, Muscles, Sinews, and Tendons, of her Leg, quite to the Bone, and stript them down to her Heel; besides, the Shuttle was drawn up and let down upon the Small of her Back several times. The Child lived from *Monday* till *Friday*, and then died of her Wounds and Bruises; otherwise, in all Appearance, she might have lived to have made a fine Woman. The whole Time of her being under Water (and that at the Depth of $4\frac{1}{2}$ Feet,) was near 15 Minutes.

Attested by

John Bailey, *Miller*.

Rebecca Yates, *the Mother*.

The Mark $\dagger$ of Grace Cooper,
the Miller's Maid.

An Account of a Treatise intituled, Opusculum de Morbo Colico Danmoniorum, eoque maximè Epidemico, annexed to a Book intituled, Observationes de Aëre, &c. Auctore Joanne Huxham, M. D. by T. Stack, M. D. F.R.S. No. 451. p. 439. Dec. 1738.

XXV. The Subject of this Treatise is a very severe Colic, attended with bilious Vomitings excessively sharp, Constipation, excruciating Pains in the Abdomen, and several other Parts of the Body, a Palsy of the upper Extremities chiefly, and other dreadful Symptoms.

It was extremely epidemic among the poorer sort of People, from *Autumn* 1724, to the next ensuing Spring, which Year there was a vast Quantity of Apples, and consequently of Cyder; and it returns more or less every Year that Fruit abounds: Wherefore Dr *Huxham* ascribes it's Cause to the excessive Use of Apples and new Cyder.

In this Treatise, besides an accurate Description of the Distemper in it's several Stages, with the best Methods of Cure the learned Author could devise from long and large Experience, the Reader will find curious Disquisitions on the Nature of Apples, new Cyder, and Wine; their good and bad Effects, the Benefit of good ripe Cyder: Useful Observations on the Bile, especially when it becomes porraceous or black, acid or alkaline, and the prodigious Acrimony it sometimes acquires: On the good Effects of the continued Use of *Eccoprotics* in proper Cases; with several others equally valuable, which are much better set down in the Treatise, than can possibly be done in any Abstract.

An Account of a Book intituled, Diff. E-pistolica de

XXVI. There are, according to Dr *Trew*, two remarkable Observations, which animal Bodies suggest, 1st, That the same general Ends are accomplished in different Animals by all the possible Varieties of

of Means. 2dly. That Animal Bodies are Machines, which produce in themselves all those Changes, that are necessary for their Preservation and Well-being. Thus the same general Ends of Chylification, Circulation, Secretion of Bile, &c. are accomplished in different Animals by Organs that differ considerably from each other; and in the same Animal the Body of the *Fœtus* is very different in it's Structure from that of the Adult, at the same time that this Difference is effected by the Body itself, each subsequent Variation, the natural and mechanical Consequence of that which immediately preceded, and the whole conducted in the best possible Manner for the Welfare and Happiness of the Animal.

The Author's Design in this Dissertation is to consider those Differences of a Human Body before and after Birth, which affect the Circulation of the Blood. And for this Purpose he has given us 78 very curious and accurate Figures of the Parts relating thereto, such as the Heart, and Trunks of the great Blood-vessels, the Liver, the *Vena Portarum*, the Umbilical Chord, &c. subjoining to them a very minute and precise Explanation of each. Some of these Figures represent the Parts as they appeared immediately upon Dissection, others as inflated and dried, others again as injected with Wax; and lastly, others as having been first injected, and well dried, then cleared of the Injection, and laid open, in order to shew the several Cavities and Valves in their natural Dimensions and Positions. This last Method he prefers to all the rest, and observes, with relation to it, that the Injection must not be thrown in too hot, and that the internal Parts of the Preparation must be perfectly dry before we attempt to evacuate it; inasmuch as a Neglect of either of these Cautions would make the Valves, and their Membranes, shrivel up and contract themselves from their natural Sizes and Positions. The Manner of doing it is to suspend the Preparation in a proper Vessel placed in a gentle Heat, having first made an Aperture in the most depending Part, for the Injection to run out at.

From these Figures, with their Explanations, our Author draws the following Anatomical and Physiological Conclusions.

1st. That, contrary to *Casserius's* Figure, the umbilical Vein enters the Liver towards the left Part of it.

2dly, That the Sulcus of the Liver, through which the Umbilical Vein passes, is not always the same. In some Subjects it surrounds the Vein along it's whole Passage, in others only in Part of it's Passage, and in others it is an imperfect Channel, which merely receives the Vein.

3dly, There is but one Umbilical Vein, it empties itself into the left Extremity of the *Sinus Venæ Portarum*, and sends no Branches to the Liver.

4thly, The Communication between the Umbilical Vein, and the *Sinus Venæ Portarum*, is so free, that the Blood has no Obstacle in passing

differentiis
quibusdam in-
ter hominem
natum & nas-
cendum inter-
venientibus,
deque vesti-
giis Divini
Numinis inde
colligendis.
Autore *Christ.
Jacobo Treu,*
Noribergiae,
1736. 4to. by
*David Hart-
ley, M. B.*
F. R. S. No.
457. p. 436.

passing either Way. Our Author asks therefore, What is the Cause of the Blood's Motion from the Umbilical Vein into the Liver, and whether the Pulsation of the Umbilical Arteries be one sufficient to produce this Effect?

5^{thly}, The *Vena Portarum* sends no Branches to the Liver, but opens into a particular *Sinus*, called *Sinus Venæ Portarum*; and this Opening is nearer to the right Extremity of the *Sinus* than to the left.

6^{thly}, The Diameter of the *Vena Portarum* is much less than that of the Umbilical Vein. The Diameter of the left Part of the *Sinus Venæ Portarum* is generally larger than both these together, never much less than that of the Umbilical Vein; and the Diameter of the *Canalis Venosus* is least of all. The Blood therefore of the *Vena Portarum* mixes with that of the Umbilical Vein in the *Sinus*. And since the Blood of the Umbilical Vein, which abounds with chylous Particles, does thus mix with that of the *Vena Portarum* in the *Fœtus*, it may be asked, Whether in Adults the Branches of the *Vena Portarum*, which arise from the Stomach and Intestines, do not suck up some chylous Parts from the Aliment? And whether both in the *Fœtus*, and in the Adult, Chyle be not a necessary Ingredient in the Composition of Bile? It is certain, that the Chyle passes into the *Vena Portarum* in Birds.

7^{thly}, The *Canalis Venosus* empties itself into the *Cava Inferior*, where the three Veins arising from the Liver empty themselves.

8^{thly}, The *Valves* which are placed at the two Extremities of the *Canalis Venosus*, facilitate the Ascent of the Blood in it, and also contribute to close it after Birth.

9^{thly}, The *Valve* of the Coronary Vein is nothing else but it's external Coat, something elongated within the Cavity of the right *Auricle*; and it's Use is to close the Orifice of this Vein when the *Auricle* is distended with Blood, just as the nervous Coat of the Bladder closes the Orifices of the Ureters when the Bladder is distended with Urine.

10^{thly}, *Eustachius's Valve* is found both in the *Fœtus*, and in the Adult; and it's Use seems to be, to direct the Blood's Motion variously, according to the various Circumstances of the right *Auricle*, during it's *Diastole* and *Systole*; and principally to hinder the Regress of the Blood into the *Cava Inferior*, when the *Auricle* is contracted.

11^{thly}, The Use of the *Foramen Ovale* and *Canalis Arteriosus*, seems to be, to intercept Part of the venal Blood, and transmit it to the left *Auricle* and *Aorta*, that so the whole be not forced upon the Lungs during their State of Inactivity in the *Fœtus*; of the Membrane, which is placed before the *Foramen Ovale*, to direct the Communication of the *Auricles* before Birth, and prevent it afterwards; and lastly, of the valvulous Productions at the two Extremities of the *Canalis Arteriosus*, in like manner to direct the Blood in it's Motion through this Canal before Birth, and to exclude it afterwards. Here our Author enters into a very minute Examination of Monsieur Mery's Hypothesis, but does not agree to it; affirming, that the Membrane of the *Foramen Ovale*

Ovale is so placed as to permit the Blood to pass freely from the right *Auricle* to the left, during the *Diaſtole* of the *Auricles*, but never from the left *Auricle* to the right.

12thly, The Use of the *Urachus* in the human *Fœtus* is not yet discovered. Our Author here supposes, according to the Determination of the best Anatomists, that the human *Fœtus* has no *Allantois*.

13thly, The Situation of the Stomach in the *Fœtus* is such, as makes up for the want of Action in the *Diaphragm*, as far as relates to Digestion. For as in the Adult, the Action of the *Diaphragm* facilitates the Descent of the Aliment, so in the *Fœtus* the *Cardia* is made to rise above the *Pylorus* more than in the Adult, from it's Connexion with the *Diaphragm*, for the same Purpose.

14thly, The Smallness of the Stomach in new-born Children shews, that it ought not to be oppressed either with much Aliment at once, or with such as is gross.

15thly, The Descent of the *Testicles* into the *Scrotum* does not always happen at the same time.

16thly, The recurrent Nerve seems to be some way subservient to the *Canalis Arteriosus*. This our Author conjectures from it's passing round the *Aorta* just where this receives the *Canalis Arteriosus*; but observes, that the Knowledge of the Use and Action of the Nervous System is much more imperfect than any other Branch of the Animal Economy.

There is a short Dissertation (with 4 Figures of the Tongue, it's Vessels, Glands, Muscles, and Nerves annexed) by the same Author, whose principal Intent is to shew, that the Vessels called salival Duets by Coschwitzius, are not salival Duets, but Veins.

CH A P. VII.

The Bones, Joints, and Muscles.

- I. 1. **I**T is the Skeleton of a Man, whose Bones, during his Life-time, were almost all grown into one entire Bone; so that now his Flesh is taken from them, he is, without further Trouble, one entire Skeleton. The only Bones he could move before his Death, were the Wrist of his right Hand, and the Bones of his Knees, so that he could move his Legs a little; and, when set upright, could in about $\frac{1}{4}$ of an Hour get a Foot forward.
- For many Years before his Death, he could not alter his Posture in the least. His Name was *William Clarke*. He was maintained till his Death by one Mr *Aldworth* in this County. He was valued by his Master on account of his Honesty. The only Use he was capable of being,

Concerning an extraordinary Skeleton, by the R. R. Robert Lord Bishop of Corke. No. 461. p. 810. Aug. &c. 1741. Dated Corke, Aug. 8, 1738.

being put to, was that of watching the Workmen; for, when he was once fixed in his Station, it was impossible for him to desert it.

At about 18 Years of Age, he began to be unwieldy, and so continued growing more stiff, till he lost all Use of his Limbs, and died in the 61st Year of his Age. The Posture into which he fixed at last, is somewhat like that of the *Venus of Medicis*, only that his right Hand is the lowest, and the left Hand does not rise higher than the Elbow of the right. He was originally deformed, his left Shoulder rising higher than his right; the *Vertebrae* of his Back are exceedingly bent inwards towards the lower Part, with an Inclination towards the left Hip. The *Os Sacrum* is so bent outwards, that you have no Sight of it at all, as you view the Skeleton in Front. His left Knee does not come down so low as the right by 3 or 4 Inches. There is hardly one Bone in his Body in the Figure it ought naturally to be, except the Bones of his Legs, which are not much distorted.

He is one entire Bone from the Top of his Head to his Knees. His Head seems regular, and the Sutures pretty distinct, though more united than in common Skulls. His Jaw-bones seem entirely fixed, and grown together, as are also the Teeth in the hind Part of the Jaw. His fore Teeth are very irregular, which left a Vacancy for him to suck in his Food at. Out of the Back of his Head there grows a Bone, which shoots down towards his Back, and passes by the *Vertebrae* of the Neck at about an Inch Distance: This Bone unites to the *Vertebrae* of the Back, and the *Scapula* of the left Shoulder, from whence it disengages itself again, and continues distinct, till it divides into two towards the Small of the Back, and fixes itself into both the Hip-bones behind. The *Vertebrae* of the Neck and Back are one continued Bone.

In the fleshy Part of his Thighs and Buttocks, Nature seems to have sported herself, in sending out various Ramifications of Bones from his *Coxendix* and Thigh-bones, not unlike the Shoots of white Coral, but infinitely more irregular; some behind, and some before; some in Clumps and Clusters, and others in irregular Shoots, of 8 or 9 Inches in length. You cannot pass your Hand between his two Knees, which incline much towards the right, his left Shoulder having been the highest. One of the Bones of his left Arm was once broken by a Fall, and Nature has shot out another Bone a little above the Bending of the Arm, which unites to the broken Bone, and makes it much stronger than it was before, though the Bone seems more liable to decay about the Place where it was formerly broken. All the Cartilages of his Breast, four only excepted, were turned to Bone. These four served to move his Breast in Respiration.

Out of his Heels there frequently grew Bones like the Spurs of a Cock, two or three Inches long, which he shed as a Deer does his Horns. When he was dissected, there was a Bone found in the fleshy Part of his Arm, quite distinct and disengaged from any other Bone; it

it is very thin, about 4 Inches long, and $\frac{1}{4}$ of an Inch broad, with several Ramifications. What is very odd, is, that while these Bones were growing, he never complained of any Pain in his Muscles.

2. *William Clarke*, a poor Man of the County of *Corke*, about 18 Years of Age, complained of a Stiffness in his Joints, which by Degrees increased till it came to an universal *Anchylosis*; that is, all his Joints were immoveable or ossified. He lived in this Condition 38 Years, and *Dr Barry*, the Physician at *Corke*, has made a Skeleton of him; and his Account of it is this: Not one Bone in his Body has the natural Form; for all his Joints are immoveable and ossified; and such a luxuriant Disposition had all the Humours of his Body to turn into Bone, that many little Branches of Bone, like Coral, spring from the Joints and several Parts of the Body. The whole Spine is ossified, and one intire Arch of Bone there is from the *Occiput* down to the *Os Sacrum*; out of which arises a very protuberant Bone, which serves as a fine Handle to the Skeleton. A sharp Horn, like a Cock's Spur, grew out of his Heel every Year.

—by the Rev.
Dean Cop-
ping, F. R. S.
Ibid. p. 819.

Fig. 116. *The Front of the Skeleton.*

Fig. 116, 117.

Fig. 117. *The Back-side of it.*

3. The Man died in the County of *Corke*, 20 Miles from that City: When I was there, he was Steward to *Mr Allworth*, his Name *Clarke*; the Account I am going to give, I had from the Lady he lived with. Twenty Years before he died, he got a violent Fever, by being very warm, and sleeping on the Grass, most Part of the Night. After he recovered from that Disorder, he was never free from great Pains in his Bones, and in four Years lost the Use of all his Limbs, even the moving his Jaws, that they were obliged to take out many of his Teeth, in the Front of his Mouth, to give him Sustenance, Spoon-meats, and Ale, on which he lived 16 Years: In those Years he could neither sit or lie down, but slept in a Sentry-box, with a small Board which ran in a Groove, and against that he leaned his Stomach: He could never move his Head, by a Bone that grew from his Scull to his Back-bone. I wrote you before, that he slept in the Box, but should have let you know, he did not live in it; for whenever the Weather would permit, he got into the Air: He could move himself on even Ground, with a little kind of Jump, and stand many Hours in the Garden, leaning his Back against a Tree, or Wall: They think his moving with that Motion, and being so much in the Air, kept him alive so long.

—by Mrs —
Ibid. p. 820.

II. In Nov. 1737, a Gentleman, aged 27, complained to me of a Swelling in the Inside of his right Thigh (being in every other respect in perfect Health). Upon Examination, it appeared to be an encysted Tumour of the steatomatous Kind, lying loose between the *Sartorius* and *Vastus Internus* Muscles. I told him, I could propose no way of curing it, but by taking it out; which was accordingly done, and he very well in 6 Weeks.

*An Account of
Tumours,
which render-
ed the Bones
soft, by Mr
Pott, Surgeon.
No. 459. p.
622. Jan. &c.
1741.*

After.

After this he continued well for near a Year (except that he now and then complained of a slight Pain in the Joint of that Hip, which went off and returned at different times); and then fell into such a Disposition to sleep, that no Company or Diversion, nor his own Endeavours to the contrary, could keep him awake after 8 or 9 o'Clock in the Evening, if he sat down.

This continued on him for 3 or 4 Months, and then the Pain in his Hip grew worse; for which he used the Cold bath, Flesh-brush, and riding on Horseback, but without any Effect.

Hereupon he asked the Advice of Dr *Beaufort*, who put him into a Course of the *Æthiops Mineral*, *Cinnabar of Antimony*, and *Gum Guaiacum*, with the *Spa-water*, and purging with *Calomel*, by Intervals: This Method he pursued for a considerable time, but without any Benefit.

After this, by the Advice of some Acquaintance, he took 3^{ls} of *Salt of Hartshorn* Night and Morning, in a Draught of warm *Whey*, for some time; but without any sensible Effect, even by Perspiration.

Some little time after this, he began to complain of a slight periodical Heat and Thirst, which returned every Night, with a quick hard Pulse, but which was not so great as to make him uneasy.

It was now *Sept. 1739*, when, having an Opportunity of going with some Friends, he determined to try what the *Bath* would do for him: In his Journey thither, the nocturnal Heat and Thirst increased so much, as to prevent his sleeping; but in the few Days that he spent in recovering from the Fatigue of the Journey, they seemed to go off again.

He then began to use the Waters both internally and externally; upon which the last-mentioned Symptoms again appeared, and he was obliged to desist, and use cooling Medicines.

His Physicians then advised him to bathe the affected Limb only; upon which they returned again, and with such Violence, that the farther Use of the Waters was thought highly improper, and he left them off.

During this time the Sight of his left Eye grew dim, which Dimness increased gradually for some little time, till he became quite blind of that Eye; the Bulb of it being considerably enlarged, and thrust forward out of the Orbit.

For the most part of the time he had been at *Bath*, he had generally been very costive; and, upon leaving off the Water, had no Stool for some Days; for which Reason a common Clyster was given, and produced so profuse a Discharge of serous Matter, and continued for so many Hours, (almost incessantly) that he was reduced as low as possible.

For some time past. several small Tumours had appeared in different Parts of him, *viz.* 5 or 6 on his Head, 2 or 3 on his Back, and one in the Neck, all lying just under the Skin, and sensibly increasing every Day, till they came to a considerable Size.

Dec. 2, 1739, he returned to London.

His chief Complaints now were an excessive Languor, an Inability to move his right Hip (and when moved by another Person, a very acute Pain in it); an Incapacity of sleeping when in Bed, and an intense Thirst in the Night, with a quick hard Pulse.

He now took the Advice of Dr Hartley and Dr Shaw, who prescribed him the *Cinnabar* of *Antimony* three times a Day, to drink the *Selters* Water, and keep to a cooling Regimen: and allowed him a moderate Dose of the *Pill Matthæi* every Night; by means of which he got some Sleep, of which he had for some time been absolutely deprived.

When he had taken the *Cinnabar* 5 or 6 Days, and during that time had no Stool, it was thought proper to give him a Clyster; which brought away all the Medicine, without the least Alteration; nor was there ever after this Time any Appearance of any *Mucus* being secreted by the Intestinal Glands, he never going to Stool above once in a Week (and then there came away a few Lumps of Excrement as hard as Pieces of Wood); which were expelled with such Labour and Fatigue, as can hardly be imagined; though he generally took an oily Clyster to render it more easy, and washed down his Medicines with a soapy Draught.

The Joint of the Hip was now become quite stiff, all the Inguinal Glands being loaded with the same kind of Matter of which the other Tumours seemed to be composed; and a large Cluster more of them might be felt under the *Glutei Muscles*, and behind the *Trochanter*.

The *Cinnabar* was now left off, and mercurial Uction proposed and consented to; and accordingly a proper Quantity was rubbed in every Night, stopping now-and-then to see what Turn it would take; and in this Course he continued for more than a Month, but without any Benefit; nor did the *Mercury* produce any visible Effect on him.

Sir Edward Hulse, being called in, directed the burnt Sponge, which he took for some time, till, growing worse and weaker, he determined to try Mr Ward.

He took his sweating and purging Medicines 2 or 3 times, but found no Sort of Effect from them; and being now quite tired of Physic, and reduced extremely low, he determined to pass the rest of his Time as easily as he could, by gradually increasing his Opiate; and in this manner languished, incapable of stirring or helping himself, till May 2, 1740, and then died.

For a considerable Time before he died, he was nourished by Fluids only: Yet, as soon as ever they were received into the Stomach, in however small Quantity, they gave him an acute Pain at the Bottom of his Belly just above the *Pubis*.

For 2 Months, or more, before his Death, he could never make any Water while he was up, but always made a good deal at different times when in Bed.

Soon after his Return to *London*, I opened the Tumour I had taken out of his Thigh 2 Years before, and found the Inside of it ossified.

Upon Dissection, the first thing that offered itself was a large Tumour on the *Sternum*, which had been perceived about 3 Months before he died: It was as large as a *Turkey's Egg*, and so hard and immovable, that I was in doubt whether it was upon or under the Bone.

Upon removing the Skin, it appeared covered by the Expansion of the Tendons of the intercostal Muscles, and the *Periosteum*: This Coat being taken off, it was of a suetty kind of Substance for about $\frac{1}{2}$ an Inch deep; and below this was a kind of Cartilage intermixed with a great many bony Particles. I then shaved off all this diseased Body even with the Surface of the rest of the *Sternum*, but found no Bone, it being quite dissolved and confounded with the Mass of Matter that composed the Tumour, which was equally protuberant within the *Thorax*, and composed of the same Materials.

Part of the 5th and 7th Ribs were dissolved in the same manner, into a kind of Substance between Bone and Cartilage, with a thick Coat of steatomatous Matter.

Within the Cavity of the *Thorax* were 37 of these diseased Bodies, most of them attached either to the *Vertebrae* or the Ribs; and wherever they were attached, the *Cortex* of the Bone was destroyed, and it's internal cellular Part filled with the diseased Matter.

Immediately above the *Diaphragm* was a large scirrhus Body, lying across the Spine and the *Aorta*, the latter of which lay in a *Sinus* formed in it's lower Part; it had no Attachment to any other Part, and weighed $13\frac{1}{2}$ Ounces; and from it's Situation, I think, must have taken it's Rise from some of the *Lymphatic Glands* lying about the *Thoracic Duct*.

From the Origin of the *Aorta*, from the Heart, quite up to the Basis of the *Cranium*, all the Blood-vessels were surrounded with these scirrhus Bodies, and the *Thyroid Gland* was diseased in like manner, and bony within.

On the left Side was another of these Bodies, made out of the *Glandula Renalis*, weighing $9\frac{1}{2}$ Ounces.

On the right, the *Glandula Renalis* was in a natural State; but the *Cellular Membrane*, which surrounds the Kidney, was filled with a large Cluster of these Bodies of different Sizes, some of them entirely suetty, others intermixed with bony Particles: 3 or 4 of them were attached to the Body of the Kidney, and these were a sort of Cartilage, beginning to ossify.

The *Pancreas* was quite scirrhus, and very large.

One very large Tumour sprung from the spongy Body of the third *Vertebra* of the Loins, the bony Texture of which was so dissolved, and mixed with the Matter of the Tumour, that the Knife passed through it with great Ease.

The inner Side of the *Os Ilium*, all the *Ischium* and *Pubis*, were covered with these Appearances; and upon removing them, the Bone was found in the same State as the *Sternum* and Ribs.

The Middle of the right *Os Femoris* was surrounded with a Mass of the same Matter, and the Bone underneath in the same State.

In the Bottom of the Orbit, surrounded by the *Recti Muscles*, was a pretty large *Steatoma*, which occasioned the Protrusion of the Eye; and, by pressing on the optic Nerve, (in all Probability) the Blindness.

III. The Wife of one B. S. in the Year 1738, was taken with a Diabetes, with the usual Symptoms, viz. A frequent and copious Discharge by Urine, a gradual Wasting of the Body, a hectic Fever, with a quick low Pulse, Thirst, great Pains in her Shoulders, Back, and Limbs, and Loss of Appetite. She continued in this manner 2 Years, (notwithstanding the Use of Medicines generally prescribed in such Cases) much emaciated; at which time she was attacked with an Intermittent, which soon left her; after which the Diabetes gradually decreased, so that in some few Months she was entirely free from that Disorder, but the Pains in her Limbs still continued. She recovered her Appetite very well, breathed free and easy, and her Hectic very much lessened, though she had some Appearance of it at times.

About 18 Months ago, she had such a Weakness and Pains in her Limbs, that it confined her to her Bed altogether; and in a few Months her Bones in her Legs and Arms felt somewhat soft to the Touch, and were so pliable, that they were bent into a Curve; but for several Months before her Death, they were as limber as a Rag, and would bend any way, with less Difficulty than the muscular Parts of a healthy Person's Leg, without the Interposition of the Bones.

The 12th of April 1742, after a long and tedious Illness, she died, near the Age of 40: And, having the Consent of her Friends, I had the Curiosity to examine more particularly into the several Matters before-mentioned. Upon raising the *Cutis*, I found the *Membrana Adiposa* much thicker than I expected in a Person so much emaciated: The *Sternum* and Ribs, with their Cartilages, were very soft; and all the cartilaginous Parts of the Ribs, at their Articulations, from the *Clavicle* downwards, were doubled over one another on the left Side, about an

Inch, in this Form , only flatter. Upon raising the *Sternum*, I found the Lungs adhered very close to the Ribs, for 4 or 5 Inches on each Side; but were more loose and flaccid than usual, and much less in Size: Her Heart was of the common Bigness. Upon viewing her Liver, I found it at least $\frac{1}{3}$ bigger than common; and her Spleen was about $1\frac{1}{2}$ Inch in the longest Part, and a Quarter thick: The *Intestines* were very much inflated.

She had Appearances of several *Anchyloses* formed in the small Joints, viz. carpal and metacarpal Bones; but, upon laying them open, I found them only like a thin Shell: The cartilaginous *Epiphyses* of the Bones

The Bones of a Woman growing soft and flexible, by Mr Sylvanus Bevan, F. R. S. No. 470. p. 488. Read May 5, 1743.

A Case of extraordinary Exostoses on the Back of a Boy.

were entirely dissolved, and no Parts of the Heads of the Bones remaining, but an Outside, not thicker than an Egg-shell.

Upon making Incisions in her Legs and Arms, 5 or 6 Inches long, I found the outer *Laminae* of the Bones soft, and become perfectly membranous, about the Thickness of the *Peritoneum*, containing (instead of a bony Substance) a Fluid of the Consistence of Honey, when it is thick, of a reddish Colour, not at all disagreeable to the Smell: There was no Appearance of any Bones in her Leg and Arms, except near the Joints, which were in part dissolved, and what remained were very soft, and full of Holes, like a Honey comb: Also the Bones of the Head would easily give way to the Pressure of the Finger.

It is remarkable, that those Parts of the Bones that are the most compact and hard, were first dissolved, while their Heads, which are more spongy and soft, had not so entirely lost their Substance.

When she was in Health, she was 5 Feet high, as I am informed by her Husband: I measured her after her Death, and she was but 3 Feet 7 Inches in length, though all her Limbs were stretched out strait, which is 17 Inches shorter than she was in her Health: The Bones, which serve as Levers for the Muscles to act upon, being dissolved, these had nothing to keep them extended in their usual Position.

The Person was under the Care of Dr *Cadwallader* of *Pennsylvania*.

A Case of extraordinary Exostoses on the Back of a Boy, by Mr John Freke, F. R. S. Surgeon to St Barth. Hosp. No. 456. p. 369. Jan. &c. 1740.

IV. April 14, 1736, there came a Boy of a healthy Look, and about 14 Years of Age, to ask of us at the Hospital, what should be done to cure him of many large Swellings on his Back, which began about 3 Years since, and have continued to grow as large on many Parts as a Penny-loaf, particularly on the left Side: They arise from all the *Vertebrae* of the Neck, and reach down to the *Os Sacrum*; they likewise arise from every Rib of his Body, and joining together in all Parts of his Back, as the Ramifications of Coral do, they make, as it were, a fixed bony Pair of Bodice.

It is to be observed, that he had no other Symptom of the Rickets on any Joint of his Limbs.

A large Piece of the Thigh-bone, which was taken out, and it's Place supplied by a Callus, by R. Richardson M. D. F. R. S. No. 461. p. 761. Aug. &c. 1741. Fig. 118.

V. 1. The following Case was drawn up by Mr *Wright*, a Surgeon, in *Bradford*, in the West-Riding of *Yorkshire*, who performed the Cure; and a few Days ago, for my Satisfaction, brought the Person hither, who that Day had walked 9 Miles before Noon. I examined the Part where the Bone was taken out, which is on the Inside of the Thigh, about 4 Inches above the Knee; and found the Thigh quite strait, but rather thicker than the other, where the *Callus* supplies the Defect of the Bone taken out. He appears to be very well and healthy, and makes no Complaint of any Weakness, or Uneasiness, in the Part; neither is he in the least lame. He brought the Bone, which I herewith send, some time ago, and, at my Request, drew up the Case: I really believe the Contents to be true. I find a Case of this kind in *Ruyssch's Museum Anatomicum*, pag. 172, but he gives no Account of the Cure; neither is it so extraordinary in itself, as it is only Part of the

Os Tibiæ which is separated; and this which I send you, appears to be the whole Substance of the Bone, except what was eat away before it was taken out.

2. This Bone is Part of the *Os Femoris*, taken out of a young Man's Thigh, 20 Years old, about the latter End of March 1738. His Name is *Hird Ramsden*, he lives at a Place called *Braithwait*, near *Kigbley*. His Lameness was occasioned by a Fever, which was translated into his Thigh, where it impostumated, and was afterwards opened; but, not healing again, left 3 or 4 carious or fistulous Ulcers, which discharged a great Quantity of *Sanies*, and fetid Matter. In this Condition he had been 6 or 7 Years, before I was concerned for him, and was looked on as incurable; this continual Discharge had reduced him almost to a Skeleton. I examined his Ulcers with my Probe, and found in one of them, which was on the Inside of his Thigh, a rotten Bone: I dilated the Orifice with *Gentian* and Sponge-Tents, and afterwards laid it open about 3 or 4 Inches: I then dressed it with *Tincture* of *Myrrh*, and Dossils of dry Lint; and at every Dressing, over the carious Bone the Powder of *Rad. Aristol. Myrrh*, and *Euphorb.* in order to promote Exfoliation: With these Applications the Bone began to loosen, which looked much larger than I expected. I was afraid of making another Incision, because of the crural Artery, which lay very near the Place where the Bone was taken out: I therefore chose rather to do it gradually by dilating the Orifice, than run the risque of another Incision. The same Dressing was continued, and the spongy Flesh kept down with the Powder of *Merc. præcip. rub. & Alum. Ust. aa.* At every Dressing I raised the Bone with a hooked Instrument, and in about 4 Months time I got it quite out. The Cavity was afterwards kept open for some time, with Dossils of dry Lint, to make way for some loose Pieces that were left behind. The Ulcer, after it was well digested, healed up in a little time. During this time his Knee was very much contracted, which was afterwards extended by the Use of emollient Fomentations. He now is perfectly sound, and in a good State of Health, walks strait, and his Thigh is not any shorter than the other.

The Case, by Mr Wm. Wright, Surgeon. Ibid. p. 762.

VI. 1. *Samuel Busb*, of the Parish of *Wickham-Bishops*, in September 1704, being on the Top of a very high Timber-Tree, in order to shake down the Acorns, he let go his Hold; and by falling from one Bough of the Tree upon another, he broke his Thigh-bone; and one End of it, by the Force of the Fall, stuck fast in the Ground, which fractured the Bone in another Place, about 2½ Inches above the former. This entire Piece of the *Os Femoris* was taken out, notwithstanding which, so large a *Callus* united the two Ends of the Bone, that his Thigh (when cured) was very little more than a Quarter of an Inch shorter than the other Thigh. The Surgeon, who had the Care of him, used his greatest Endeavours, during the Cure, to preserve the Extension; but he imputed the Largeness of the *Callus* to a very great

Two extraordinary Cases in Surgery, by Bezaleel Sherman, Surgeon, at Kelvedon in Essex, communicated in Nov. 1738. No 453. p. 138. Apr. &c. 1739.

Quantity of *Lap. Osteocolla*, which he made him take for 6 Weeks or 2 Months, in Powder with Milk, in an Electuary, in his Bread, and in his Pudding; in short, in almost all the Food he took.

2. ——— *Fitch*, of the Parish of *Kelvedon*, had a foul Ulcer in his Mouth, with a *Caries* in the lower Jaw-bone, one Part of which, from the Suture at the Chin to the End of it under the Ear, in Process of Time entirely came out, with 3 Teeth in it. This was also owing to a great Quantity of *Osteocolla* internally given, which was thought not only to expedite this large Exfoliation, but at the same time to generate so large and firm a *Callus*, that he can chew an hard Crust, or any other Food, on that Side as well as on the other.

The Description and Draught of a Machine for reducing Fractures of the Thigh, by Mr Henry Ettrick, Surgeon. No. 459. p. 562. Jan. Ec. 1741. Fig. 119.

VII. It consists of no more than a Wheel and Pinion, with their Axles; the Roch, or snagged Wheel, being herein accounted as Part of the great Wheel, fixed in a light Frame of about 12 Feet long, the whole not exceeding the Weight of 15 Pounds; and when taken to pieces, by unscrewing the Frame-pieces, may be packed up in a common Rush-basket, belted to the Side, and conveyed to any Distance. Again, the Room it takes up in working is not a full Yard, and may be set up and fixed for Use in a few Minutes. In using this Machine, the Surgeon needs but one Assistant; whereas, in most other Methods, their Number is most troublesome and inconvenient: The Business of this Assistant is no farther than to mind the Surgeon's Orders, and move the Winch according to his Direction. When the Extension is sufficient, the Engine stays itself, and continues the Tension of the Limb, by the Assistance of this Roch, or toothed Wheel, whose Teeth are cut fine enough to stay the Engine at every Line of an Inch, and which is fixed on the Back of the aforesaid great Wheel, both to the Cross by the Help of Screws, and on it's Arbor by having it's Centre squared out, so as to fix tight thereon, and so near the Frame as only to allow a bare Clearidge: It's Teeth, standing counter to the former, admit the Spring or Catch fixed on the Inside of the Frame, to slip over the Vertex thereof, without Interruption; but in a reverse Rotation, or when the Engine is about to come up, flies into the Spaces thereof, and stays the same: The upper Part thereof projects about an Inch from the Frame, so that being pressed upon by the Finger of one Hand, the inferior Part is elevated above the Range of the Teeth, to admit the coming up of the Engine, which is to be directed by the other Hand being applied to the Winch in any Degree. This Engine has it's Power so commanded, that it may be used without Restriction, from the most robust to the most tender Frame, seeing it acts and exerts it's Power in Proportion to the Resistance made. Farther, as hinted at before, it is enriched with all those Properties, which Authors affirm necessary to a successful Operation; for this Extension, according to their Observation, is made deliberately, steady, equally, and in one continued Line, without the least Variation. And further, in oblique Fractures of the Thigh, where the Bones are apt to ride, (and therefore,

therefore, on that Account, require a continued Extension in a certain Degree, to prevent the Limbs shortening after the Cure) such a Machine must be of excellent Service; having the Property of increasing or decreasing the Extension at Pleasure, and to be perfected without the least Jar or Tremor.

The necessary Appendages are Bands, by which the Engine extends the Limb, and deserve the following Observations: Immediately from the Axle of the great Wheel comes a Girt, at the other End of which Girt is a Hook, which links into a Swivel-ring at the Bottom of a Sole-plate: This Sole-plate answers the Shape of the Foot, and is made of well-hammered Brass, the Inside of which is padded, to fit easy to the Foot: The upper Part hath a Strop fixed thereto, which clasps over the upper Part of the Metatarsal Bones; and to keep the Stropps ending in the Sole-plate from galling or pressing the Sides of the Foot and Ankle, there project 2 Arms from the Sides of this Sole-plate, to which the Stropps coming from the Ankle-band are fastened. That the whole Limb may be kept in a Line with the Machine, the Leg is suspended by Bands, one of which is placed at the Ankle, from the Sides of which pass two Stropps, to join the inferior Knee-band: From this Band pass two Stropps to the superior Knee band: All these Stropps are designed to divide the Extension, so that all Parts may equally bear alike, and so to secure the Joints of the Limb from the Violence of the Extension. The Insides of these Stropps are lined; the Bands incircling the Limb are contrived in the same manner as the Bow or Spring of a Truss, having strong Clasps at the Ends, after the manner of those for Pocket-books, to fit any Dimensions. The Band embracing the Part above the Fracture, and from which pass two Stropps to the Head of the Bed, to make the Counter-Extension, is of the same kind as the former, and is to be kept on, the whole Time of Decumbiture, to prevent the Patient's Body sinking on the Fracture, and thereby contracting the Limb. The exterior of the two last mentioned Stropps presses just beneath the great *Trochanter* on it's Outside; the other comes from the anterior Part of the same Band, and in such a Scite as to give the Patient Liberty to raise himself at Discretion. To preserve the natural Curvity of the Thigh, it would be necessary to have a large broad Band arising from the Bedside, to encompass the fractured Part, and keep it steady.

Explanation of Figure 119. A. A. Represents the Bed. B. The Patient. C. The Machine at the Feet of the Bed. D. D. The Frame. E. The great Wheel. F. The Rock wheel, with a Catch and Spring, to prevent the Wheel going back. G. The Pinion. H. The Winch. I. The Arbor of the great Wheel, whereon the Girt K is fixed: The Diameter of the Barrel thereon is 2 Inches. L. The End of the Girt fixed by the Ring M, to the Sole-board N. O. The Band which passes over the Instep. P. The Ankle-band. Q. The Strop which passes from the Sole-plate to the Ankle. R. The Strop continued from the Ankle to the Knee. S. The Knee-

Knee-band. T. The superior Knee-band, with the Strop continued as before. V. The Band embracing the Part above the Fracture. W. W. The Counter-strops passing to the Bed's-head. X. The lateral Band to preserve the Curvity of the Thigh-bone.

P. S. I thought it would not be improper, if I should attempt to demonstrate to what great Exactness Machines of this Nature may be made to operate.

A Specimen of which I beg leave to present as follows: Admit the Barrel 4 Inches Diameter, the Roch-wheel to be cut with 48 Teeth, the great Wheel to have 32, answerable to a Pinion with 8. The Reason of pitching on a Barrel of this Dimension is, that it may be more precisely judged what Extension has been made; for repeated Revolutions of the Girt upon the Cylinder, in extending, would, by it's uncertain Increase, subject the Judgment to err; whereas the utmost Extension required comes within one Revolution of this Barrel. The Teeth of the Roch to be numbered at every $\frac{1}{4}$, which will be at every Inch, and equals in one Revolution the Periphery of the Barrel; consequently every Tooth of this Roch will stretch the Limb $\frac{1}{4}$ of an Inch: So though the Spring or Catch to the said Roch should pass the capital Numbers, and stop in the Interspaces thereof, it is only counting from the last capital Number to the Place where the Spring is, and that gives the Parts of the Inch: By the same Rule the Winch, every Turn it makes, will gain $\frac{1}{4}$ of this Wheel, which will be 3 Inches, or 12 Teeth; and 4 Revolutions thereof will answer to the Periphery of the Barrel: So by measuring the sound Limb, and comparing the fractured therewith, the Extension required may be nearly demonstrated. With the Use of this Machine, I should recommend the 18 Tail Bandage to the circular Rollers of *Hippocrates*, since they are both less troublesome to the Surgeon, and less painful to the Patient; nor yet so liable to wreath the Muscles, and distort the Ends of the fractured Bones.

And to render this Machine of the like Service at Sea, where we are in the greatest need of Helps of this Nature; I have designed a Bed to swing and yield to the Ship's Motion, whereon the Patient is to be laid, with the Engine thereto fixed, that the frequent Discomposure and Disturbance given to the fractured Part by the Ship's rolling and working at Sea, may be prevented.

The Amte of Hippocrates for reducing Luxations of the Arm with the Shoulder, rectified, by M. le Cat, M. D. F. R. S. Surgeon to the Hôtel Dieu at

VIII. 1. It is known to consist of an horizontal Lever A, and of a fixed Point B, made of a Piece of Wood standing vertically, to the Extremity of which the Lever is joined by a Hinge. The Patient sitting, and his Arm, that is hurt, being raised, the Machine is pushed forward under the Arm-pit, so that the vertical Piece of Wood is applied along the Ribs, where the Lever enters into the Arm-pit up to the End of the luxated Bone, or even farther. This Circumstance is essential, and even recommended by *Hippocrates*: "In the first Place, says he, care must be taken, that the Top of the Piece of Wood must

"must go above the Head of the Arm, quite into the Arm-pit." The Arm is tied to this horizontal Piece, and then an Assistant bears upon the *Scapula* and the *Clavicula*, as is seen in the Figures of *Scultetus*, Plate 21, whilst another presses down the Lever, and thus makes the Bone come into it's Place again.

Hippocrates, giving the Description of this Invention, and of it's Use, acknowledges, that this Method of reducing the Luxations of the Arm is incomparably better than all the others; for, says he, the working of it is sufficiently powerful; and provided Care be taken to push the Lever farther on under the Arm-pit than where the Bone of the Arm lies, the Extensions and Counter-Extensions are equal, and the Bone of the Arm is safe: He adds, That by this Method fresh Luxations are reduced sooner than one thinks, and even before the Extension appears to have been made; and that, as for old Luxations, they can only be reduced by this Method; unless, by their being too old, the Cavity of the Articulation be filled up, and that the Head of the Bone has formed to itself an Articulation in the Place where it fell: He even believes, that such a Luxation may be reduced; for, says he, What is there that cannot be moved by sufficient Forces? But at the same time he thinks, that the reduced Bone will not remain in it's Place, but luxate itself again, and fall back into the new-formed Articulation, which it has formed to itself.

M. *Petit*, in his Treatise of the Diseases of the Bones, was sensible of all the Perfections of the *Ambe* of *Hippocrates*: He acknowledges, with that Father of Surgery, that this Machine has a *sufficient Force*, and is more than sufficient; that it makes *an Extension and a Counter-Extension equally strong*; he even adds, that *the Arm is placed there as it ought to be, in order to relax the Muscles*, or at least stretch them equally, which is the fourth Rule the Author proposes to be observed, in making the Extension and Counter-Extension. But at the same time M. *Petit* does not dissemble some essential Defects he finds in this Invention, and which, without doubt, were unknown to *Hippocrates*.

The capital Defect in this *Ambe* is, that it *pushes the Head of the Bone into it's Cavity, before the Extension and Counter-extension are made*. The dangerous Consequences of this Defect, are, according to M. *Petit*, 1st, That the Reduction is very difficult, because the Bone is not conducted by the same way it took in luxating itself, and that one meets with Obstacles from the Parts that surround it, even the *Scapula* itself, on which it articulates. 2^{dly}, In making those Efforts for surmounting those Obstacles, one runs the risque of turning inwards the cartilaginous Edge of the Cavity of the *Scapula*, or the *Capsula Ligamentosa*. The second Defect of the *Ambe* of *Hippocrates* is, that it cannot move the luxated Bone but from below upwards; consequently, this Machine is only proper in Luxations directly downwards; and yet it is certain, that the Arm luxates itself both outwards and inwards; and even it is known to all Practitioners, that Luxations forward are very frequent. Here you

Rouen. Extracted from the French, by P. H. Z. F. R. S. No. 469. p. 387. Read Feb. 17, 1742-3. Fig. 120.

have a great Number of Luxations of the Arm, where the *Ambe* becomes useless: Now, if the *Ambe* of *Hippocrates* is useless in all Luxations outwards, and in Luxations inwards, which are very frequent, if it is dangerous in Luxations downwards, the only ones it is fit for, one must own, that this Machine, so much cried up by *Hippocrates*, is yet very imperfect.

These Imperfections are real ones; but the Advantages, which one cannot but own it has, are so constant, and so superior to those of any other Practice, that one naturally inclines not to part with it, but becomes desirous to remove those Defects it has, without which it would certainly be, as *Hippocrates* assures, the most perfect of all Machines made use of in reducing a luxated Arm: For supposing an *Ambe*, which makes a sufficient *Extension* and *Counter-Extension*, before it leads the Bone into the Cavity, or at the same time it does so, and which also might lead it from the right to the left, and from the left to the right, as well as from below upwards, it is certain, there can be no Method to be compared to this; because there is none in which concur at once so much Force and Expedition, joined to such Simplicity, Regularity, and Safety, that are quite singular. For that Method, in which a Surgeon only employs his own Strength, and that of his Assistants, is commonly insufficient; and the other, in which he helps himself with the Pulley, is perplexed with a great *Apparatus*, is long, and still very much wants the Hands of the Surgeon, and of his Assistants: All which are Circumstances which render the Method more complicated, and less sure.

These are the Motives that have engaged me to contrive the new *Ambe*, I herewith have the Honour to lay before the Society, in which I have endeavoured to rectify all the Defects before-mentioned.

*A Description
of the new
Ambe.*

The Basis of the whole Machine is an Elbow-chair all of solid Wood, higher than others usually are, in order to give room to the Lever to play the more freely, which cannot be lowered any farther than to the Floor on which the Elbow-chair stands: To prevent any Uneasiness to the Patient from that Height of the Chair, it has a Foot-stool that makes Part of the Chair, and brings the Seat to it's usual Height.

Each Arm of the Chair is pierced with a round Hole, to receive the *Stem* or *Foot* of the *Ambe*. If the Luxation is on the right Side, the Foot is run through on the same Side, and *vice versa*. The Patient is tied partly to the Back of the Chair, partly to a Piece joined to the Chair on that Side where the *Ambe* is placed. This solid Union of all the Pieces of the Machine between themselves, and with regard to the Patient, furnish it's Action with all the Force and Certainty possible. The *Ambe* of *Hippocrates* can play but to a small Extent: It is separate from the Chair in which the Patient sits, and he is left to the Care of the Assistants; all disadvantageous Circumstances, which are remedied by my Machine.

In that of *Hippocrates*, the Body of the Patient has no other Support against the Extension of the Lever than the very vertical Piece B, on which the Lever rests; this Piece is narrow, has no Proportion, or, if one may say so, no Union with the Figure of the Body to which it is applied, and consequently must change his Position on that Piece upon the least Effort the Patient makes. Fig. 120.

The Foot of my Lever has no Connexion with the Patient's Body: There is between the Foot and his Body a particular Piece, which I call the *Bodice*. One will see there, that it is made to fit itself to the Body; and, in order to render that Application easy, that Part which touches the Body, is quilted. This Bodice is fixed to the Arm of the Chair between 2 large Iron Checks, *a, b*, by 2 strong Iron Pins, which run through them, and are stopped at their Extremities with Nuts skrewed on. The concave Part of this Piece, where the Body enters, is placed perpendicularly under the End of the Lever, however so that the Lever be a little farther advanced towards the Patient, than the Bottom of the Bodice, to the end that the Lever may thrust itself the better in under the Arm-pit. As there are Cases where the Head of the Lever ought to be very short, or very near the Point it rests upon, and others again, on the contrary, where that Extremity of the Lever ought to be longer, and farther off the Point of it's Rest, the Bodice of course ought to be set backwarder or forwarder, as the End of the Lever is, the Direction of which it follows every where. For this Reason we have contrived 2 Rows of Holes along the Sides of the Bodice, and between these 2 Sides we got a Notch cut out, to make room not only for the Foot, or for the Point it rests upon, which may meet there, but also for a Part of the Lever, which I call it's Spur, which always moves towards that Notch when the Lever is lowered. The Figures and the Use of the Machine will shew the Necessity of this Construction much better than any Description. From the said Bodice come out 2 broad Straps of the strongest Leather with their Buckles. One of those Straps is to go about the Back of the Chair, and round the Body of the Patient; the other goes over the Shoulder, very near the Articulation, and keeps the *Scapula* and the *Clavicula* in their Situation against the Efforts of the Lever. Fig. 122.

That Part of my Machine, that may be called the *Ambe* properly said, is composed, like that of *Hippocrates*, of 2 Pieces; one vertical, which I call the Foot of the *Ambe*; and the other horizontal, which forms the Lever. It is chiefly in these two Pieces, that my *Ambe* differs from that of *Hippocrates*.

The Foot is a Piece made either of Wood, *Fig. 122*, or of Iron, *Fig. 124*. It's upper Extremity is split into a sort of Mortise, which receives the Spur or Tenant T of the Lever A, B. It is pierced by several Holes, which answer to as many others on the Spur. Below this Mortise, the Foot becomes more slender and cylindrical; by this Part it enters into a round Hole in the Arm of the Chair; this slender Part Fig. 122, 124.

of the Foot is pierced by several Holes, in order to run an Iron Pin through, which lies flat on the Arm of the Chair, and keeps the Foot raised to a Height proper for the Person that undergoes the Operation: For the greater Security one may run 2 Pins through; one which rests upon the Arm of the Chair, and the other on the Seat itself, through which the Foot passes also. The Iron Foot may be provided with a sort of large Ring C, under the Pin, which will render it's Rotation the easier. If one should prefer an Iron Foot, one may easily judge, that the Hole for it in the Arm of the Chair must be made narrower, either by filling up the old one with an Iron Box or Clout, which may be taken away, if one will use a wooden Foot; or one may even at first fit those Holes for the Iron Foot, setting the wooden one quite aside.

Fig. 124.

Fig. 121.

Fig. 126.

Fig. 125.

Fig. 127.

The Lever A, B, H, B, is the most compound Piece of all, and withal the most important. It is made of a real Lever A, B, and of a Piece fitted to it D, G. The Lever properly so called A, B, is made round in it's inferior Surface; the upper Surface is flat, and all along on the Middle of it there runs a Rod, forked at the End, which fits to a Groove of the same Figure in the inferior Surface of the Sliding-piece F, G. This Lever grows less and less towards the Extremity A, where the moving Power is to be applied; the other Extremity B, is somewhat rounded off at it's End, in order to insinuate itself the better under the Arm-pit. On this bigger Extremity is a sort of a *Spur* or *Tenant*, T, the upper Part of which is joined to the Lever by 2 Iron Pins, so that, upon taking out the Pins, the Spur comes out; and separates itself from the Lever. It was necessary to make this Spur moveable, and give it the Figure of a square Rule in which it appears, in order to bring it quite close to the End of the Lever, or set it back, according as it may be necessary. For this Reason the upper Part of this Spur *a, b*, slides along in a Mortise or Groove of the Length of one Foot contrived under the Lever, beginning from it's Extremity B, to which answers the Shoulder *b*, of the Spur.

Fig 123, 124.

Fig. 125, 126.

The rest of the Tenant, or it's principal Part *c*, is fitted to enter into the Mortise *d*, which is the uppermost Part of the Foot. They are both of them pierced with a Row of Holes, through one of which one must run an Iron Pin, to unite them, and to form the Point of Rest, or the Hinge of the Lever. Towards the other Extremity A of the Lever, there is a Piece of Iron C, made Arch-wise, under which passes the elastic Tail D, *f*, of the Rod fastened to the Sliding-piece F, G, and into which catch Teeth made on the said Tail. This Iron Arch ought to be very solid, because it keeps down the Arm, and supports all the Effort of the Lever. I will give to the Sliding-piece F, G, which is fitted to the Lever, the Name of the *Bracer*; it is a Groove made of one Piece of Wood. This Piece is hollow in the upper Surface, as is just now said, to place the luxated Arm into; this Cavity is quilted, and has three Girts H, with Buckles, to tie the Arm fast and conveniently; they are made of strong Leather. It has on it's inferior

inferior Surface a Groove with a Dove-tail K, K, to lay hold of the Rod of the Lever, and to slide in it without being separated from it, unless it be in sliding beyond the Extremity B, of the Lever, where it pulls out like a Drawer, which is easily done, if the Bracer has nothing to stop it upon the Lever. The Extremity of the Bracer, which answers to the thick End of the Lever, is rounded, in order to enter jointly with it under the Arm-pit; the other gives hold to the Piece of Iron D, E, which I called above by the Name of *the elastic Tail of the Bracer*. This latter consists of four Parts; the Fork F, which attaches itself to the inferior lateral Surfaces of the Bracer; the Spring f, which is the Piece that follows next, the longest and slenderest of all; the Teeth E, and the Handle D.

The Patient, being undressed down to the Waist, is placed in the Arm-chair. Next, the Lever, furnished with it's Bracer, is raised and kept in a horizontal Position, taking great Care, as *Hippocrates* recommends, to push this Bracer as far as may be under the Arm-pit to the End of the Bone of the Arm, and even beyond if possible, to the end that the *Humerus*, supported by the Bracer in all it's Length, may be secure against all the Power of this Machine, and that it's Violence may only act upon those Muscles which keep this Bone out of it's Place. Besides the Quilting, which the Bracer is lined with, a small Cushion is put upon it's Extremity, in order to lodge still more conveniently the Head and the Neck of the *Humerus*, and to preserve the soft Parts from any Contusion, which the Impulse of the Machine might produce, by it's greatest Forces acting upon that Part.

*The Use of the
new Ambe.
Fig. 129.*

The Arm being thus placed and well stretched out upon the Bracer, you tie about it 2 Sliding-knots, one above the Elbow, and the other over the Wrist, after having guarded those Parts with a very thick and soft Compress; the 2 Sliding-knots are fastened to the Fork of the elastic Tail of the Bracer; after which you complete the fixing of the Arm with the 3 Girts of the Bracer, under which are also put Compresses like those just mentioned.

The Arm being thus well adjusted, you endeavour to give to the Body and to the Hollow of the Articulation of the luxated Bone the proper Situation and Steadiness necessary for the Success of the Operation which is easily executed with this Machine, by the Girts of the Bodice, of which the horizontal one keeps the Patient's Breast closely applied against this Piece, and the vertical Girt retains the *Scapula*, the *Clavicula*, in short, all the Parts where the Bone is to be pushed back, in a Situation proper for receiving it, and for not deviating by yielding to the Efforts of the Machine.

Every thing being thus disposed, the Surgeon places himself behind the Patient, mounted upon something that raises him high enough to inspect the Effects of the Process; to examine by the Touch where it operates; in short, to conduct the whole by Feeling and by the Eye. The Surgeon being placed, the Assistant who is to conduct the Extremity

mity of the Lever, works it according to his Directions, but perfectly slowly, that the Extensions may be made with less Pain, and more effectually.

Fig. 130.

If the Luxation is below, it is sufficient for it's Reduction to lower the Extremity of the Lever, as is done with the *Ambe of Hippocrates*. But here appears a great Difference between the working or playing of these two Sorts of Levers. The *Ambe of Hippocrates* is a plain Lever A, B, the Motion of which is from A to *a*, and consequently has for it's Extension only the Space C, *a*, when it is brought to it's last Term of becoming perpendicular, *a*, *b*, whilst it has all A, C, or 1, *a*, for it's Elevation. The *Ambe of Hippocrates* therefore almost only raises the Bone of the Arm, without scarcely stretching it; and this is the Defect, which M. *Petit* with Reason blames it for; and which is still more sensible, if one takes the Action of the Lever in D, the Point whereabouts it must meet the Edge of the Cavity, and may cause those Mischiefs that are apprehended from it; but instead of placing the fixed Point of that Lever in 1, lower it to 2, by the means of the Tenant 1, 2; then the Direction of the End of the Lever becomes A, E; it's Elevation is but 1, *b*; and the Extension it produces is A, E, or D, E: If you lower still the Lever's Point of Rest, as in 3, by a longer Spur, the Elevation of it's Extremity is reduced to 1, *k*; and the Extension it produces, reaches from A to F, if one carries those Levers as far as they will go, which is never necessary. In short, it will be in your Power to give to this Lever an Extension as great as you please, joined to a very small Elevation. To this end you need only set backward the Lever's Point of Rest, along the Perpendicular. Now this is precisely what the Spur does, which we have added to our *Ambe*; the Holes it is pierced with, as well as the Mortise of the Foot, are placed in different Degrees, as the Points 1, 2, 3; and these Holes, as has been said, are the Places of the Pin which forms the Lever's Hinge or Point of Rest.

The Gradation of those Holes therefore enables you to augment at Will the Extension, whilst the Elevation diminishes in the same Proportion; but if you have a mind the Elevation should diminish more or less than in the foresaid Proportion, for Instance, you want to make a great Extension, and a very small Elevation, there is nothing easier for it than our Machine. You need only push the Spur 1, 3, which is moveable, as you know, towards the End of the Lever to L, and stop it there: Then the End of the Lever A, L, being very short, it has but little room to play; on the contrary, if you will have a great Elevation, you need only bring back the said Spur to M, or 1, or still farther; the farther you remove from the End of the Lever, the more it will have room to play, and the more considerable will be it's Elevation. It is true, the Power of the Lever will decrease in the same Proportion; but this Power is so great, that Losses like this ought to be reckoned for nothing.

You

You have it therefore in your Power with **this** sort of *Ambe* to make, as Occasion requires, such Extensions and Counter-Extensions as you please; and you may likewise vary all the Degrees of the Elevation, which shall be necessary to give to the Bone that is to be reduced; and these are the Perfections which have been hitherto required in this Machine.

Commonly, when the Bone of the Arm is sufficiently stretched and raised, so as to be on a Level with the Cavity of the Articulation, those Bones replace themselves as it were of themselves, because this Level is not always exact; on the contrary, the Extension and Counter-Extension being never regular enough to hinder the *Scapula*, which is a moveable Part, from following a little the Head of the Bone, or it's Extension, it happens almost always, that this Head bears pretty strongly against the Edge of the Cavity, and consequently does not fail to fall into the said Cavity, as soon as it has only passed it's Edge, and even before it has met the Level, or the Axis of the Hollow of the Articulation; but it is otherwise after an Extension, a Counter-Extension, and an Elevation so regular as those which may be performed by our Machine; it may happen, that after the 3 preceding Operations, the Head of the Bone, without having touched the Edge of the Cavity, will be placed over-against this Cavity, and upon a Level with it's Axis, without being able to enter into it, by Reason of the Firmness and Exactness of the Powers for retaining the opposite Parts in this State of regular Extension; and, in this Case, there will remain for you, in order to finish the Operation, to conduct the Head of the Bone into it's Cavity, or to let it go into it: But what will you do then? If you slacken the Extremity of the Lever, or if you lift the same up, you will bring the Head back to the same Place where you took it up; that is to say, you will bring the Luxation to it's former State. If you resolve to relax the running Knots, the Operation will be long, and your Patient will have time enough to cry out.

In order to avoid these Inconvenients, I mounted the Bracer on the Lever in a Groove, and I stopped it in this State by the Teeth of it's elastic Tail; by the means of this Construction, when the Surgeon perceives, that the Bone is over-against it's Cavity, he directs the Assistant who attends the Extremity of the Lever, to press upon the Handle D of the elastic Tail of the Bracer, to the end that the Teeth placed under the Arch C, near the said Handle, may quit their Hold, and that the whole Bracer, which is now no longer stopped, may slide on the Lever towards the Patient, and by this means let the Head of the Bone enter into it's Cavity. Fig. 129.

The Necessity of this Management with our *Ambe* is a Demonstration, that it is far from having that capital Fault with which M. *Petit* reproaches the *Ambe* of Hippocrates, viz. "That it pushes the Head of the Bone into it's Cavity, before the Extension and Counter-Extension are made." I hope the Machines, whereby I have pre-

vented

vented this Fault, and have procured to my *Ambe* the opposite Perfections, will appear sufficiently simple.

Fig. 128.

If any Body should be apprehensive, that the re-entering of the Head of the Bone might be too sudden, and occasion a Shock that might hurt the said Bones, it will be easy to remedy against it, by substituting to the Stop, into which catch the Teeth of the Bracer, a toothed Wheel A, having in it's Centre a Handle B, D; which Handle during the Operation will be stopped by the Piece of Iron C, fixed upon this Piece by the Skrew F; the said Handle will also stop the Teeth E, which catch into the toothed Wheel; and when the Bracer is to be loosened, the Assistant, who holds the Lever with one Hand, will take the Handle with the other, and having got the Skrew F taken off, he will remove from the Piece C, that stops it, the Part D, B, of the Handle, by the means of it's moveable Arbor D, so that the Handle will come at a right Angle, as it is represented by Dots: Then the Assistant's Hand, sustaining all the Effort of the Handle and of the Bracer, will moderate by the Handle the sliding of the Bracer, and the entering of the Head of the Bone into it's Cavity, with all the Slowness he shall think proper for this Operation.

Thus much concerning the Reduction of a Luxation of the Arm below; it is known, that this is the only sort of Luxation in which the *Ambe* of *Hippocrates* can be made use of (the second Defect observed by M. *Petit* in this Machine). I have succeeded in remedying against this Defect by the simplest thing in the World, *viz.* by giving to the Foot that enters into the Arm of the Chair a cylindrical Shape, by which means it is able to turn all manner of ways; so that if the Luxation is forwards, one only needs turn the Extremity of the Lever accordingly, lowering it at the same time enough to make the necessary Extension and Elevation; by this Turn of the Extremity of the Lever forwards, the Head of the Bone is of necessity carried backwards, and replaced into it's Cavity. One easily conceives, that one must go to work in the opposite way, when the Luxation is backwards, and so on as for the rest; all according to the Directions of the Surgeon placed at the Articulation, who is to be attentive to examine the State of the Parts, and to order in what Direction and how much is necessary to be done.

*The Description
of an Instru-
ment for reduc-
ing a dislocated
Shoulder, in-
vented by Mr
John Freke,
Surgeon of St
Barth. Hosp.
and F. R. S.
No. 470. P.
556. Read
June 23,
1743.
Fig. 131.*

2. I should not have presented this to you, but to shew in how small a Compass the whole Power which can be made use of in reducing a dislocated Shoulder can be contracted. If therefore a Machine for this Purpose be not portable, it matters but little to an afflicted Patient 10 Miles off, how good an Instrument is out of his Reach.

This Machine, which consists of two Boxes A, joined at the Ends by two Hinges, contains, when folded together, every thing that can possibly be wanted in the Operation before-mentioned; and it may so easily be made use of, without the Assistance of any other Operator than the Surgeon employed, that I may venture to affirm, a Patient may



Fig. 116.



Fig. 117.

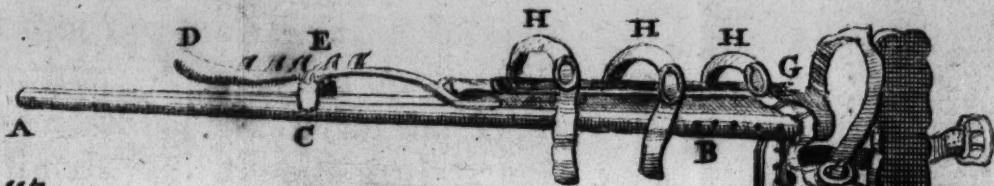


Fig. 121.

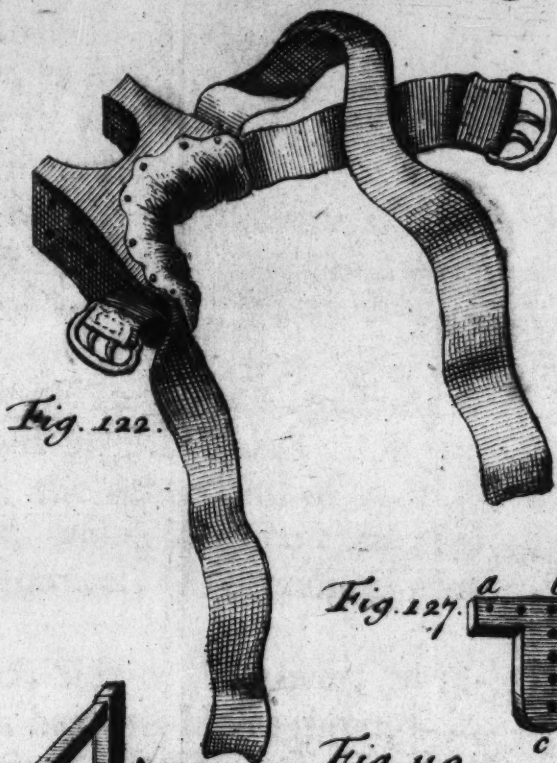


Fig. 122.

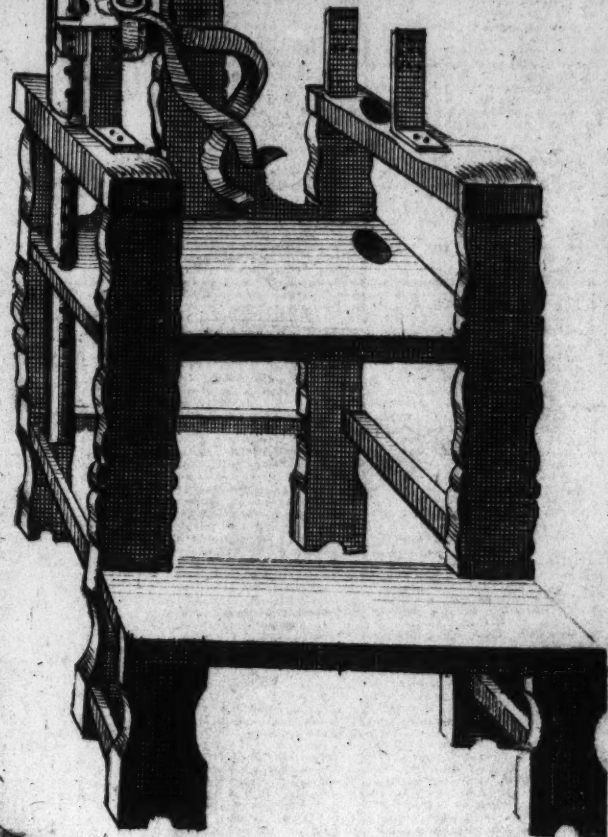


Fig. 123.

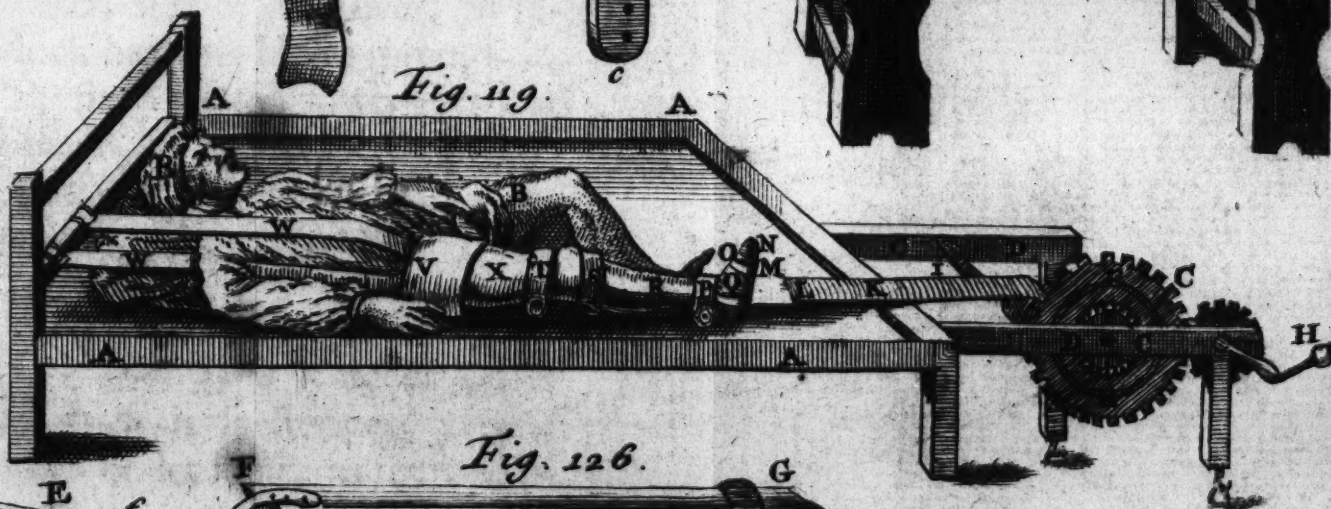


Fig. 124.

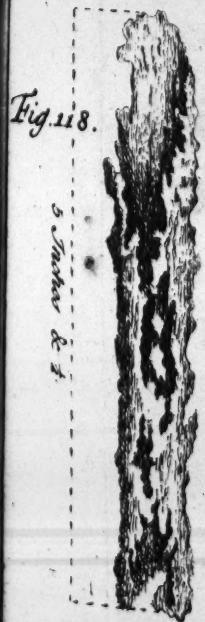


Fig. 118.

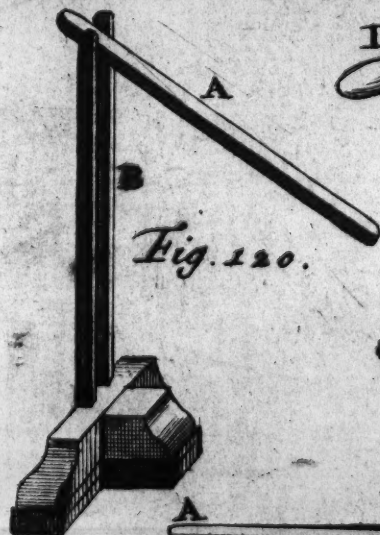


Fig. 120.

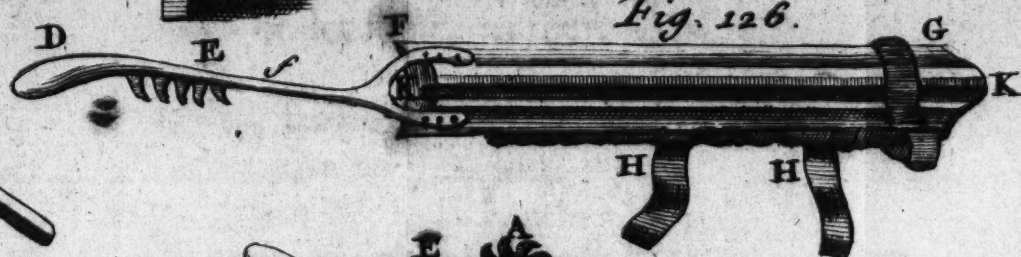


Fig. 126.

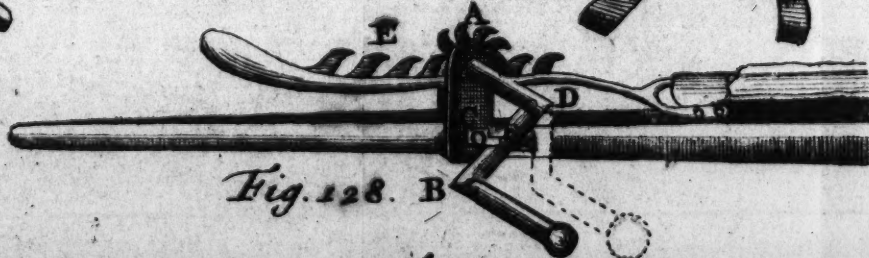


Fig. 128.

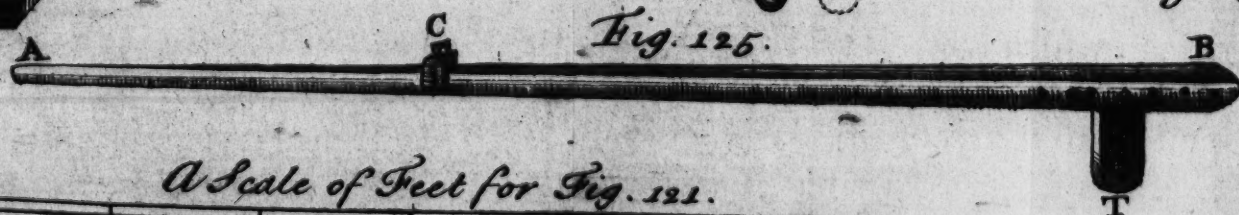


Fig. 125.



Fig. 123.



Fig. 124.

A Scale of Feet for Fig. 121.

may be set down, the Instrument applied, and the Shoulder reduced, in one Minute, ordinarily speaking.

The Length of this Instrument, when shut up, is 1 Foot, 8 Inches, it's Breadth 9 Inches, and Thickness $3\frac{1}{2}$ Inches. When it is opened, it is kept so by 2 Hooks fixed on the Backside of it; and when one End of it stands on the Ground, the other stands high enough to become a *Fulcrum*, or Support of a Lever B B, which is fixed on a Roller b, by a large Wood Screw, which turning sideways, as well as with the Roller, it obtains a circumrotatory Motion, so that it will serve to reduce a Luxation either backward, forward, or downward.

The Roller on which the Lever is fixed, is just the Diameter of the Depth of one of the Boxes, into which are driven 2 Iron Pins, the Ends of which are received by the 2 Sides of the Box, which are an Inch thick.

The Lever is 2 Foot 4 Inches, and is cut off and joined again by 2 Hinges C, to fold up so as to be contained in the Boxes. On the Backside of it is a Hook, to keep it strait; the other End of it is to hang over the Roller about an Inch and half, which is to be excavated and covered with Buff Leather, for the more easy Reception of the Head of the *Os Humeri*.

Two Iron Cheeks D D are skrewed on each Side of the Lever, to receive through them an Iron Roller E, which has two Holes through it, to receive 2 Cords coming from a Brace F, fixed on the lower Head of the *Os Humeri*: for on no other Part of the Arm above the Cubit can a Bandage for this Purpose be useful; for if the Surgeon applies it on the muscular Part of the Arm, it never fails slipping down to the Joint, before you can extend the Limb.

The Iron Roller has a square End, on which is fixed a Wheel G, within the Cheek, notched round, which works as a Rotchet on a Spring-Ketch underneath the Lever, by which it is stopped, as you wind it with a Winch; and may at Pleasure be let loose, as there shall be Occasion for it, by discharging the Ketch.

I come now to describe the Brace F, which, compared with common Bandages, is of more Consequence than can easily be imagined by unexperienced Persons. It consists of a large Piece of Buff-Leather, big enough to embrace the Arm, sewed on two Pieces of strong Iron curved Plates, riveted together, one of them having an Eye at each End, to fasten 2 Cords in; the other is bent at the Ends into 2 Hooks, which are to receive the Cords, after they have crossed over the Arm above.

In order to keep the Patient steady in his Chair from coming forward, or letting the *Scapula* rise up, on depressing the Lever, after the Limb is drawn forward by the Winch, there must be fixed over the Shoulder a Girth with 2 Hooks at the Ends of it, long enough to reach to the Ground on the other Side, where it must be hooked into a Ring I, to be skrewed into the Floor, for that Purpose.

*An Account of
the Man whose
Arm with the
Shoulder-blade
was torn off by
a Mill, Aug.
15, 1737, by
Mr John Bel-
chier, F.R.S.
Surgeon to
Guy's Hospi-
tal. No. 449.
p. 313. Aug.
Æc. 1738.
Dated Nov.
17, 1737.*

IX. *Samuel Wood*, about 26 Years of Age, Servant to *Mr Felton*, being at Work in one of the Mills near the *Isle of Dogs*, over-against *Deptford*, and going to fetch a Sack of Corn from the further Part of the Mill, in order to convey it up into the Hopper, carelessly took with him a Rope, at the End of which was a Slip-knot, which he had put round his Wrist; and passing by one of the large Wheels, the Cogs of it caught hold of the Rope, and he not being able to disengage his Hand instantly, was drawn towards the Wheel, and raised off the Ground, till his Body being checked by the Beam which supports the Axis of the Wheel, his Arm with the Shoulder-blade was separated from it.

At the time the Accident happened, he says, he was not sensible of any Pain, but only felt a tingling about the Wound, and being a good deal surprized, did not know that his Arm was torn off, till he saw it in the Wheel: When he was a little recovered, he came down a narrow Ladder to the first Floor of the Mill, where his Brother was, who seeing his Condition, ran down Stairs immediately out of the Mill to a House adjacent to the next Mill, which is about 100 Yards distant from the Place where the Accident happened, and alarmed the Inhabitants with what had happened to his Brother; but before they could get out of the House to his Assistance, the poor Man had walked by himself to within about ten Yards of the House, where, being quite spent by the great Effusion of Blood, he fainted away, and lay on the Ground; they immediately took him up, and carried him into the House, and strewed a large Quantity of Loaf-Sugar powdered into the Wound, in order to choak the Blood, till they could have the Assistance of a Surgeon, whom they sent instantly for to *Limehouse*; but the Messenger being very much frightened, could not give the Surgeon a clear Idea of the Accident, so that when he came to see the Condition the Man was in, he had no Dressings with him for an Accident of that kind; but had brought with him an Apparatus for a broken Arm, which he understood by what he could learn from the Messenger to be the Case; however, he sent home for proper Dressings, and when he came to examine particularly into the Wound, in order to secure the large Blood-Vessels, there was not the least Appearance of any, nor any Effusion of Blood; so having first brought the fleshy Parts of the Wound as near together as he could by means of a Needle and Ligature, he dressed him up with a warm Digestive, and applied a proper Bandage: The next Morning he opened the Wound again, in Company with two Surgeons more; and not perceiving any Effusion of Blood at that time, he dressed him as before, and sent him in the Afternoon to *St Thomas's Hospital*, where he was admitted a Patient under the Care of *Mr Ferne*; from which Time he was constantly attended, in Expectation of a Hemorrhage of Blood from the Subclavian Artery; but there being no Appearance of fresh Bleeding, it was not thought proper to remove the Dressings during the Space of 4 Days, when *Mr Ferne* opened the Wound, at which Time likewise there was not the least Appearance of any

any Blood-Vessels; so he dressed him up again, and in about 2 Months time the Cure was entirely completed.

Upon examining the Arm within a Day or 2 after it was separated from the Body, I found the *Scapula* fractured transversely, as were likewise the *Radius* and *Ulna* in two Places: But whether these Bones were fractured before the Arm was torn off, the Man cannot possibly judge.

The Muscles inserted into the *Scapula* were broken off near their Insertions, but the Muscles arising from the *Scapula* came away with it entire.

The *Latissimus Dorsi* and *Pectoralis*, were likewise broken off near their Insertions into the *Os Humeri*.

The Integuments of the *Scapula*, and upper Part of the Arm, were left on the Body, as also the Clavicle.

But what is very surprizing, the Subclavian Artery, which could never be got at to be secured by Art, did not bleed at all after the first Dressing; the Artery being separated so happily, and when the Coats of it were contracted, the fleshy Parts pressed against the Mouth of it, and prevented any Effusion of Blood.

As this Case is very singular, and so remarkable, that no History can furnish us with any Instance similar to it, in order to give a particular Account of it, besides visiting the Man frequently, from his first Admittance into the Hospital, and getting from him what Information he was capable of giving me, I went myself two Days ago to the Mill, where the Accident happened, and inquired into every particular Circumstance relating to the Fact, of Mr *Felton*, with whom the Man worked, the Woman of the House where the Man was carried into, and the Surgeon that dressed him, who all certified to me what is above related.

X. An articulating Cartilage is an elastic Substance uniformly compact, of a white Colour, and somewhat diaphanous, having a smooth polished Surface covered with a Membrane, harder and more brittle than a Ligament, softer and more pliable than a Bone.

When an articulating Cartilage is well prepared, it feels soft, yields to the Touch, but restores itself to it's former Equality of Surface when the Pressure is taken off. This Surface, when viewed through a Glass, appears like a Piece of Velvet. If we endeavour to peel the Cartilage off in *Lamellæ*, we find it impracticable; but, if we use a certain Degree of Force, it separates from the Bone in small Parcels; and we never find the Edge of the remaining Part oblique, but always perpendicular to the subjacent Surface of the Bone. If we view this Edge through a Glass, it appears like the Edge of Velvet; a Mass of short and nearly parallel Fibres rising from the Bone, and terminating at the external Surface of the Cartilage: And the Bone itself is planned out into small circular Dimples, where the little Bundles of the cartilaginous Fibres were fixed. Thus we may compare the Texture of a Cartilage to the Pile of Velvet, it's Fibres rising up from the Bone, as

Of the Structure and Diseases of articulating Cartilages, by Mr Will. Hunter, Surgeon. No. 470. P. 514. Read June 2, 1743.

Of the Structure and Diseases of articulating Cartilages.

the silky Threads of that rise from the woven Cloth or *Basis*. In both Substances the short Threads sink and bend in Waves upon being compressed ; but, by the Power of Elasticity, recover their perpendicular Bearing, as soon as they are no longer subjected to a compressing Force. If another Comparison was necessary, we might instance the Flower of any corymbiferous Plant, where the *Flosculi* and *Stamina* represent the little Bundles of cartilaginous Fibres ; and the *Calyx*, upon which they are planted, bears Analogy to the Bone.

Now these perpendicular Fibres make the greatest Part of the cartilaginous Substance ; but without doubt, there are likewise transverse Fibrils which connect them, and make the whole a solid Body, though these last are not easily seen, because being very tender, they are destroyed in preparing the Cartilage.

We are told by Anatomists, that Cartilages are covered with a Membrane named *Perichondrium*. If they mean the Cartilages of the Ribs, *Larynx*, Ear, &c. there, indeed, such a Membrane is very conspicuous ; but the *Perichondrium* of the smooth articulating Cartilages is so fine, and firmly braced upon the Surface, that there is room to doubt whether it has been often demonstrated, or rightly understood. This Membrane, however, I have raised in pretty large Pieces after macerating ; and find it to be a Continuation of that fine, smooth Membrane that lines the capsular Ligament, folded over the End of the Bone from where that Ligament is inserted. On the Neck of the Bone, or between the Insertion of the Ligament, and Border of the Cartilage, it is very conspicuous, and may be pulled up with a Pair of Pincers ; but where it covers the Cartilage, it coheres to it so closely, that it is not to be traced in the recent Subject without great Care and Delicacy. In this Particular it resembles that Membrane which is common to the Eye-lids and the Fore-part of the Eye-ball, and which is loosely connected with the *Albuginea*, but strongly attached to the *Cornea*.

From this Description it is plain, that every Joint is invested with a Membrane, which forms a complete Bag, and gives a Covering to every thing within the Articulation, in the same manner as the *Peritoneum* invests not only the *Parietes*, but the Contents of the *Abdomen*.

The Blood-Vessels are so small, that they do not admit the red Globules of the Blood ; so that they remained in a great measure unknown till the Art of filling the vascular System with a liquid Wax brought them to Light. Nor even by this Method are we able, in adult Subjects, to demonstrate the Vessels of the true cartilaginous Substance ; the Fat, Glands, and Ligaments, shall be red with injected Vessels, while not one coloured Speck appears upon the Cartilage itself. In very young Subjects, after a subtle Injection, they are very obvious ; and I have found their Course to be as follows : All round the Neck of the Bone, there are a great Number of Arteries and Veins, which ramify into smaller Branches, and communicate with one another by frequent

Anastomoses.

Anastomoses, like those of the Mesentery. This might be called the *Circulus Articuli Vasculosus*, the vascular Border of the Joint. The small Branches divide into still smaller ones upon the adjoining Surface, in their Progress towards the Centre of the Cartilage. We are very seldom able to trace them into it's Substance, because they terminate abruptly at the Edge of the Cartilage, like the Vessels on the *Albuginea Oculi*, when they come to the *Cornea*. The larger Vessels, which compose the vascular Circle, plunge in by a great Number of small Holes, and disperse themselves into Branches between the Cartilage and Bone. From these again there arises a Crop of small short Twigs, that shoot towards the outer Surface; and whether they serve for nourishing only, or if they pour out a dewy Fluid, I shall not pretend to determine. However that be, I cannot help observing, that the Distribution of the Blood-Vessels to the articulating Cartilages is very peculiar, and seems calculated for obviating great Inconveniences. Had they run on the outer Surface, the Pressure and Motion of the two Cartilages must infallibly have occasioned frequent Obstructions, Inflammations, &c. which would soon have rendered our Motions painful, and at last entirely deprived us of them. But by creeping round the cartilaginous Brim, where there is little Friction, or under the Cartilage, where there is none, they are perfectly well defended from such Accidents.

It were to be wished, we could trace the Nerves of Cartilages: But, in relation to these Organs, here, as in many other Parts of the Body, we are under a Necessity, from the Imperfection of our Senses, of being satisfied with mere Conjecture. And though, from the great Insensibility of a Cartilage, some have doubted of it's being furnished with Nerves; yet, as it is generally allowed, that these are a *sine qua non* in the Growth and Nourishment of Animals, we have no sufficient Reason to deny their Existence in this particular Part. With regard to the manner of their Distribution, we may presume, from Analogy, that they follow the same Course with the Blood-Vessels.

The articulating Cartilages are most happily contrived to all Purposes of Motion in those Parts. By their uniform Surface, they move upon one another with Ease: By their soft, smooth, and slippery Surface, mutual Abrasion is prevented: By their Flexibility, the contiguous Surfaces are constantly adapted to each other, and the Friction diffused equally over the whole: By their Elasticity, the Violence of any Shock, which may happen in running, jumping, &c. is broken and gradually spent; which must have been extremely pernicious, if the hard Surfaces of Bones had been immediately contiguous. As the Course of the cartilaginous Fibres appears calculated chiefly for this last Advantage, to illustrate it, we need only reflect upon the soft undulatory Motion of Coaches, which Mechanics want to procure by Springs; or upon the Difference betwixt riding a Chamber-Horse and a real one. To conclude, the Insensibility of articulating Cartilages is wisely contrived,

trived, as by this means the necessary Motions of the Body are performed without Pain.

If we consult the standard Chirurgical Writers from *Hippocrates* down to the present Age, we shall find, that an ulcerated Cartilage is universally allowed to be a very troublesome Disease; that it admits of a Cure with more Difficulty than a carious Bone; and that, when destroyed, it is never recovered. *Hildanus*, in considering these Diseases, has observed, that when the Cartilages of a Joint were destroyed, the Bones commonly threw out a cementing *Callus*; and thus a bony *Anchylosis*, or immoveable Continuity, was formed where the moveable Joint had been. So far as I have had Opportunities of examining diseased Joints, either after Death or Amputation, I have found, according to the Nature and Stage of the Disease, the Cartilages in some Parts reddish and lax; or soft and spongy; or raised up in Blisters from the Bone; or quite eroded, and, perhaps, the Extremities of the Bones carious; or, lastly, a bony *Anchylosis* formed. But I could never see, nor indeed hear of, the least Appearance of an Exfoliation from the Surface of the Cartilage. Now, if we compare the Texture and morbid *Phænomena* of those Cartilages together, all the diseased Appearances will admit of as rational a Solution, as perhaps any other Part of the vitiated Oeconomy.

It appears from Maceration, that the transverse Fibrils are extremely tender and dissoluble; and that the Cohesion of the Parts of the strait Fibres is stronger than their Cohesion with the Bone. When a Cartilage therefore is inflamed, and soaked in purulent Matter, the transverse or connecting Fibres will the soonest give way, and the Cartilage becomes more or less red and soft, &c. If the Disorder goes on a little longer, the Cartilage does not throw off a Slough, but separates from the Bone, where the Force of Cohesion is least, and where the Disease soon arrives, by reason of the Thinness of the Cartilage. When the Bone is thus exposed, the Matter of the Ulcer, or Motion of the Joint, corrodes or abrades the bony Fibres. If the Constitution is good, these will shoot forth a *Callus*; which either cements the opposite Bones of the Articulation, or fills up the Cavity of the Joint, and for the future prevents Motion. But if, unfortunately the Patient labours under a bad Habit of Body, the Malignancy, having got Root in the Bone, will daily gain ground; the *Caries* will spread, and at last the unhappy Person must submit to Extirpation, a doubtful Remedy, or wear out a painful, though probably a short Life.

Explanation of
the Figure.

Figure 132. represents a View of the Patella on the Backside, where it is covered with a smooth Cartilage. In this we may observe, AAAA the Surface of the Cartilage, appearing, when the Perichondrium is removed, like Velvet. Near the Middle, Part of the Cartilage is taken out, in order to shew B the subjacent Surface of the Bone: And C the Thickness of the Cartilage, where the perpendicular Fibres are seen very

Fig. 129.

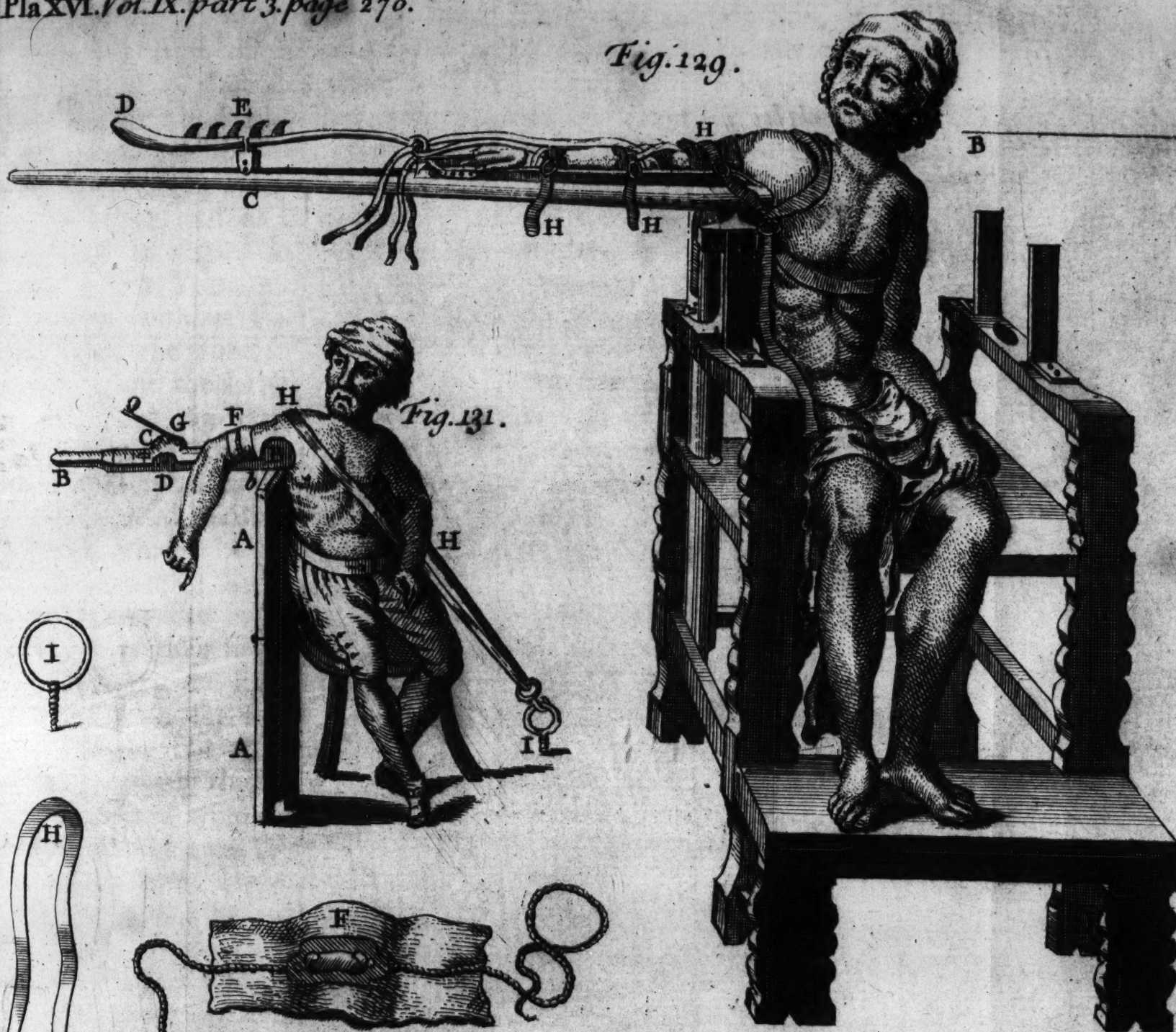


Fig. 131.



Fig. 130.

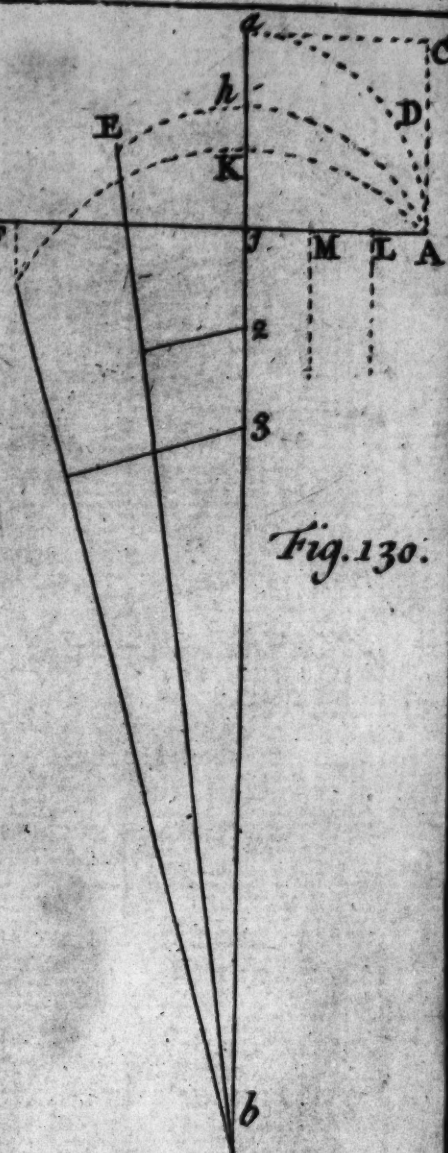
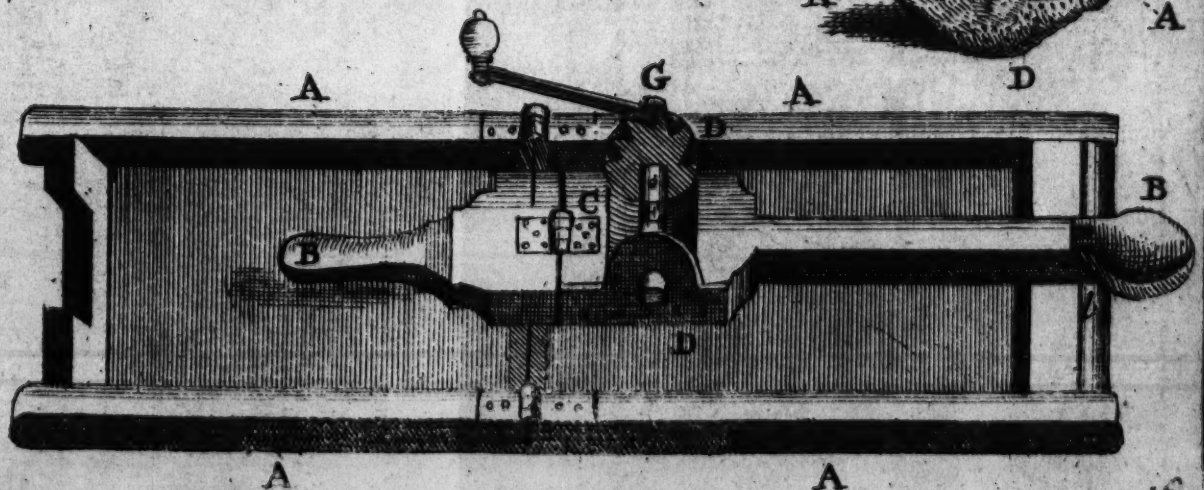
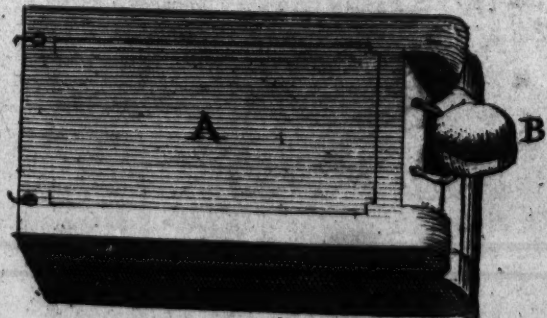
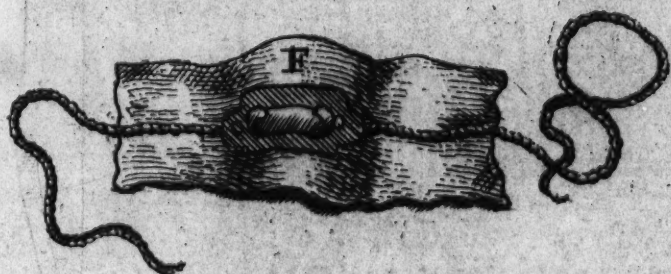
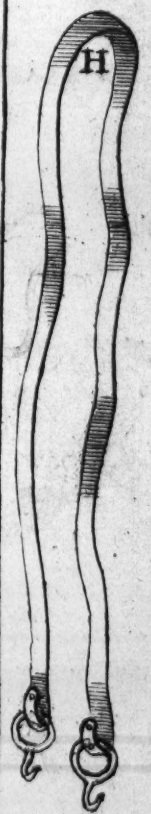


Fig. 132.



very distinctly. D. The scabrous lower Point of this Bone, into which the Ligament is inserted that binds it to the Tibia.

XI. William Hedges of Stratton in Somersetshire, a Farmer's Son, of 25 Years of Age, of a muscular healthy Habit, having never known any kind of Disease; about 8 Years since first observed a small Swelling on his Right Leg near the superior Epiphysis of the Tibia, which (to use his own Terms) he called a Splint, about the Bigness of a split Horse-bean. As he was not conscious of any Bruise on the Part, and as it was wholly free from Pain, so the only Reason he had to regard it, was from it's constant Increase, which during the 2 first Years was very slow; but afterwards it increased so fast (though without Pain) as to render him altogether incapable of Labour from the time of Hay-Harvest 1735.—

An Account of a very extraordinary Tumour in the Knee of a Person, whose Leg was taken off by Mr Jer. Peirce, Surgeon at Bath; No. 452. p. 56. Jan. &c. 1739. dated, Bath, June 11. 1737.

Upon taking off the Limb in May last, I found it weighed, with the Leg and Foot, 69 Pounds, which (to the best of my Remembrance) is 27 more than the Leg some Years since taken off at St Bartholomew's Hospital by Mr Gay, for the like Disorder. The Operation itself afforded nothing uncommon, except the Quantity of recurrent Blood, which, however greater than usual, seemed proportional to the increased Bulk of the Part.

Upon examining this surprising Tumour, the adjacent Muscles were found destitute of their fibrous and fleshy Appearance (probably from the Pressure, and great Extension, which they had suffered, and the little Motion which for some Years they had employed upon the Tarsus and Toes); but the Fascia and common Membranes of the Muscles, being greatly thickened and callous, adhered to the subjacent Tumour; and upon removing this callous Integument, the Tumour appeared covered with great Quantities of Blood-Vessels, much distended, and of a Colour more intensely red than natural.

The Tumour itself was cartilaginous for the Space of $\frac{1}{2}$ an Inch from it's external Surface; from whence it formed numberless bony Substances of various Forms, Colours, and Consistences, which (growing more and more numerous, as they lay deeper) at last formed a continual Substance completely ossified: In the Centre of this bony Substance we found about a Quart of mucilaginous Liquor, no ways fetid, (though it was then ten Days from the Operation) whose Colour and Consistence nearly resembled that of Linseed Oil; in which we observed many little bony Substances loose and floating, similar to many others adhering to the internal Surface of the Cavity, all which had nearly the Appearance of those irregular Incrustations, which in hollow Rocks are sometimes made by the dropping of petrifying Waters. After the Operation, every Circumstance of the Cure proceeded as I could wish, and the Stump is now healed.

It seems well worth observing, that the Parts above the Tumour were very little altered from their natural State. The Cartilaginous Extremity of the Femur was perfectly smooth; nor had the Rotula suffered.

suffered any other Injury except the Ossification of the Ligament by which it is fixed to the *Tibia*; but the superior Extremity of the *Fibula* was wholly lost in the Tumour.

May we not justly admire the Goodness of a Constitution, which could bear such enormous Extensions in the Integuments, the tendinous *Fascia*, and even the Bone itself, without Pain and Inflammation? Or can we sufficiently wonder, that the Fluids should be so little disposed to putrify, as to bear so great a Diminution in their Motion, and for so long Time, without vitiating the Constitution, or tainting even the Parts affected. Fig. 133. represents the Limb immediately after the Operation: Fig. 134 shews the Tumour as opened.

Fig. 133.

Fig. 134.

Description of
a Machine
for dressing
and curing
Patients, who
are very un-
wieldy, and
are under the
Surgeon's
Hands for
some Ailment
on the Back,
the *Os Sa-*
crum, &c. or
are apprehen-
sive of it. By
M. le Cat,
F. R. S. Sur-
geon to the
Hôtel Dieu
at Roüan,
and Royal De-
monstrator in
Anatomy and
Surgery: Ab-
stracted from
the French by
P. H. Z. F.
R. S. No.
468. p. 364.
Jan. &c.
1743-4. Read
Feb. 3.
1742-3.

XII. A Lusty Body labours, as it were, under the Richness of it's Constitution, which at the long-run turns to Misery: The Vessels of a plethoric Body are, even in the most vigorous State of it, hardly able to convey all the Juices; but when that Vigour is lost, they stagnate and corrupt, and produce numberless Distempers: If any critical and salutary Evacuations free it of Part of it's Burden, there remain flabby Bags and Cells ouzing Humours, which become Materials for Imposthumes, for want of a proper Supply of Animal Spirits, and laudable Humours, which are compressed and stopped by the Weight of the respective Parts. The increasing Weakness of the Patient hinders him from stirring, and putting himself into the Situation necessary for his Cure: His enormous Bulk makes it even impossible for his Attendants to assist him; the Number of Hands that are then employed, rather give him Torment than Ease, and the Apprehension of changing his Posture at so painful a Rate, will make him rather prefer an easy Situation, that will at last lead him to the Grave.

Since my practising Surgery, I have had several of those unhappy Persons under my Hands, and even some who were dearer to me than the rest of my Patients; and I have had the Grief to see them carried off in despite of all the Resources my Attachment furnished me with, and those my Profession suggested to me then, as generally used. Finding these latter insufficient by repeated Experience, my Imagination at last made me conceive a sort of *hanging Cradle* or *Hammock*. In Jan. 1741, I gave the Draught of this Machine to some Workmen, having then under my Hands the Abbé de la *Bucaille* of this City of *Roüan*, a Person of a vast Bulk, paralytic, and labouring under a Mortification about the *Os Sacrum*. The following Explanation of the Figures will shew the several Uses of the Machine.

Fig. 135.

Fig. 135. represents the Patient's Bed-chamber with a Bed in it without the Bedding, in order the better to shew the Machine. Upon it lies a sort of Boat of *Turkey Leather*, full as long as the Bed, with very strong Hems all round, and Eylet-holes for receiving

ceiving Hooks, that serve to life up this *Hammock*. The Hooks are fastened to several Ropes, all which depend on as many Cross-beams of very solid Wood. The Cross-beams consist of one Beam of the Length of the whole Bed, running Lengthways over the Middle of it, and 4 transverse Beams, the 2 middlemost of which are somewhat longer than the others. The Ropes on which the *Hammock* hangs, are fastened to the Extremities of these Beams, which keep the *Hammock* displayed; and on the same Extremities are also fastened all the Ropes, which unite in one that passes through the Testern of the Bed, and above it hangs on a Pulley, that is fixed to the Cieling of the Bed-chamber. Another Rope that is run into the Pulley, passes into another Pulley corresponding to it, hanging at some Distance from the Bed, where a Man is placed to pull it, and raise the *Hammock*.

What we chiefly intend in dressing a Patient in Question, are,

1st, To dress and refresh him, that is to say, gently to place him in a proper Posture, easy both for himself, and those who attend him.

2^{dly}, To put him into an easy Situation, that may also promote his Recovery: The making of his Bed often, is already of great Ease to him; but at the same time it is necessary, that his Wounds or Ailments may not bear upon any the least thing possible; and therefore his Bed ought to be composed of several small Matresses, or of Matresses of several Pieces, each with it's Tick over it; these Matresses ought besides to be supplied with Numbers of Pillows, each with it's Pillow-bier, so that he who waits on the Patient, may place them where it is proper, for the Ease of the Person, and of the Part affected. Nothing is more proper for this Purpose than our *Hammock*; the Patient may be lifted up from his Bed, and suspended just above those Pillows, and higher yet, if necessary.

Our *Hammock*, being of *Turkey* Leather, fits itself to those Pillows, and gathers them in as the lower Sheets would do; but the Inconveniency of Sheets we have supplied with those Ticks and Pillow-biers covering the Matresses and Pillows.

The *Turkey* Leather of the *Hammocks* is full wide, not only to cover the whole Bed, but even so as that the Hems or Borders of it may hang down round about it, and tuck in under the Matresses: The Bottom of it is pierced in those Places which answer to the *Anus*, or any Part affected, so that the Evacuations may find their Passage into Receptacles between the Pillows ranged accordingly.

When the Patient is to be dressed or refreshed, the Borders of the *Hammock* are taken up, and the several Hooks passed through, by which he is to be suspended, as appears in the Figure; and then a Man, being placed at the Rope that runs over the Pullies, lifts the Patient up to the Height necessary for the Surgeon to search and dress the Wound, and for the Assistants to make his Bed, which, even

for the greater Conveniency, may be pulled out from under the *Hammock*.

When all is done, the Bed is pushed back again to it's former Place, the Patient is gently let down upon it, the Cross-beams are lowered and detached both from the *Hammock* and the Block, and put out of the Way into a Corner of the Room; instead of it, a Rope is fixed to the Hook of the Block, tied into an Eylet at the End, coming down towards the Bed within the Patient's Reach, in order to help himself when he wants to stir a little.

The *Hammock* being displayed, and the Cross beams taken away, the Patient is wrapped up in Napkins as much as possible, to supply the Sheet he wants between his Body and the Leather of the *Hammock*; he is afterwards covered with an upper Sheet, and other necessary Bed-cloaths.

Fig. 136.

Fig. 136. This Machine may be farther improved by Use. For Instance: Since I contrived this, I thought that instead of the Border or Hem of the *Hammock*, one might make strong cylindrical iron Rods, like Curtain-Rods, formed into a Square, somewhat larger than the Bedstead, to the Four Corners of which are fastened as many Ropes, which meet at the Pulley; in which Case the Cross-beams, and the Ropes depending on them, become useless; and instead of a *Hammock* all of one Piece, one might fix 4 broad Straps of Turkey Leather to Two Sides of the square Rod, which may be placed under such Parts of the Patient's Body as will be proper, and which leave a Space between each other where it is convenient. These Straps may be fastened to the iron Rods by several Buckles with Rings to slide along the Rods, by the Help of which the Straps may be pushed on to such Places where there is Occasion; they may also thereby be stretched or slackened, or even be taken off, or changed as is thought fit. After the Patient has been dressed, and the Bed made, the four Ropes may be taken off both from the Rod and from the Block; and the Rod be let drop with the Extremities of the Straps down upon the Floor round the Bedstead, which being narrower than the Square of the Rod, the latter will easily slip over it.

I have given these two Methods together, as there may be Occasions when one becomes preferable to the other.

An Account of a Book entitled, Osteographia, or, the Anatomy of the Bones, by William Cheselden, Surgeon to Her Majesty, F. R. S. Sur-

XIII. For the Frontispiece to the Book our Author has made choice of a Story very suitable to a Work of this Kind, which is a Description that *Galen*, in *Lib. i. Cap. 2. de Anatomicis Administrationibus*, relates of a Robber that was killed on a Mountain by a Traveller, whom he attacked, and whose Body no one cared to have buried, but were rather glad that so wicked a Man should become a Prey to the Vultures. Two Days after *Galen* went to see this Body, and found the Bones picked as clean as if prepared for the Instruction of Students.

This

This Opportunity he mentions as a Piece of good Fortune, because, in those Days, it was very rare to meet with a Skeleton, by what he observes to the young Physicians in the same Book, that he used to examine Bones which he found in Graves, and in the Ruins of Monuments; and once he met with a Body, which, by the over-flowing of a River, was washed out of a Sepulchre that was slightly built on the Bank of the said River; the Flesh being destroyed, the Bones were left entire.

He likewise takes notice, that there was a Skeleton in the Physick-School at *Alexandria*, which he thought would amply compensate the Trouble of any one to go on Purpose to study.

The Figure representing *Galen* contemplating the Skeleton, is taken from a Philosopher of *Salvator Rosa*.

At the Bottom of the Title-Page he has given a Print of a *Camera Obscura*, which he mentions in his Preface to have contrived and drawn all his Bones by, and without which Assistance (notwithstanding he employed the greatest Artists in their way) he found it impossible to give a true and perfect Representation of them, there being so much Difficulty to express the Outlines of Bones in their different Attitudes.

This occasioned my looking into *Vesalius's* Book of Anatomy more carefully than I had done before, whose Figures have hitherto been esteemed the most beautiful of their Kind, and are performed in so exquisite a Taste, that they have usually been taken for *Titian's*, and always considered as a Study for Painters.

Yet whoever will give himself the Trouble to measure his Bones with real ones, will find many egregious Errors, which would take up too much room here to particularize; but upon the whole I find there is no kind of Proportion kept, and that his Bones in general are between $\frac{1}{3}$ and $\frac{1}{4}$ Parts too short for their Breadth: and tho' his 3 Skeletons have been so remarkably famous, that several Anatomical Writers have copied after them, yet when carefully examined, it will be very easy to discover many Imperfections in them, though, all together, they strike the Eye wonderfully.

This *Camera* he mentions not only as a great Help to him, by giving true Proportions and Outlines, but likewise for a more speedy Dispatch; doing more this way in one Day, than could possibly be done without in several.

It is a long square Tube set upon two Treffels (as represented in the Print before his Book) whose Inside is made black, to prevent the Reflection of Light; towards that End which is nearest the Object, is a Convex-Glass placed in a sliding Frame, through which the Rays passing from the Object, converge and meet in a Focus upon the Table-Glass placed near the other End, analagous to the Crystalline Humour and *Retina* in the Eye.

geon to St
Thomas's
Hospital, and
Member of the
Royal Aca-
demy of Sur-
gery at Paris.
By John Bel-
chier, Sur-
geon, F. R. S.
No. 430. p.
194. Nov.
1733.

The Object here represented is the Trunk of a Skeleton fixed to a Painter's Ezel, which being inverted, appears upright to the Table-Glass, on the rough Side of which the Artist delineates with a Pencil, which afterwards he traces off on Paper. The Convex-Glass placed in the sliding Frame being moved backward or forward, makes the Object bigger or less, keeping it's due Proportions.

This *Camera* has several Advantages beyond the common one; for in this, Objects as big as the Life may be taken, or reduced gradually to any Scale; whereas the other only diminishes, and that in a very great Degree.

In this Work the gradual Increase of the Bones is described, even from the first Stages of Ossification, to that of an Adult, when every Bone is represented as large as the Life in different Attitudes; as likewise most of the Bones sawed through the Middle, to shew their internal Texture: And in order to shew how they are articulated to each other, there are several Plates wherein they are reduced to lesser Scales, and again reduced, to give a View of them all united together in Representations of six different Skeletons, where the Difference of the Growth of the Bones is very apparent, as likewise the different Shapes of the Male and Female Bones. There are likewise several Plates of Bones prepared on Purpose to shew the Ligaments which unite them together, as also the Cartilages at their Ends, besides a great Variety of most curious and remarkable diseased Bones.

And at the Front and Close of every Chapter, as likewise the Blank Pages, are Skeletons of the most remarkable Animals of their kind, which are not only very ornamental, but even very useful; most of them describing the Œconomy of the different Species of Animals.

The Author in his Treatise gives a general Description of the whole Work, though not so minutely as some might expect, he thinking it useless to give long Descriptions in a Work of this Kind, one View of such Prints shewing more than the fullest Description can possibly do; for which reason, in the several Chapters, the mechanical Contrivances of the Bones are rather treated of than their Shapes.

Each Book has a double Set of Prints, one before they are lettered, to shew them in their full Perfection; and the other with Letters, answering to their Descriptions.

The Advantage of a Set of Prints before they are lettered, will readily be perceived, when compared with the other: And how much these Figures excel any others of their kind, will appear at the first View, they being executed in so free and open a Style, and expressed with so much Spirit, and (what is very rare) without the least kind of Exaggeration.

At the End of his Preface he takes notice, that when he began this Work, he proposed to go through the whole System of Anatomy, adorned with the Comparative, in three Volumes in this manner; the farther Prosecution of which Design he has now entirely laid aside,

it requiring so much Leisure, as renders him incapable of the Performance; and the vast Expence attending such a Work (besides other Inconveniences) will, I doubt, prevent the Execution of it by any Body else, especially in so grand a manner, this being undoubtedly the most magnificent Work of the kind now extant.

XIV.

EXPERIMENTS.

I. *The Elasticity of the Blood-Vessels, and Non-Elasticity of the Nerves, demonstrated on a Nerve, Artery, and Vein of a human Body cut out, and the Degree of the Elasticity measured.*

II. *The Distribution of the Nerves, Arteries, and Veins, to the Antagonist Muscles of the Arm of a human Body, shewn in an Anatomical Preparation; for demonstrating the Necessity of such a Distribution towards the Performance of Muscular Motion.*

III. *In the Air-Pump, on the jugular Vein of a Calf; to shew that there is Air in the Blood.*

This Experiment stands in the Minutes of the Royal Society, as first performed by me, about 17 or 18 Years ago; and is now only repeated on Occasion of these Lectures.

IV. *Upon a human Artery, and the Rose of Jericho; to shew that the Elasticity of Solids arises from the Fluids they imbibe or contain.*

V. *On a Frog; to shew the Existence of a Fluid in the Nerves, and that Muscular Motion is begun by an Impulse on it through the Nerves into the Muscles.*

Upon these Experiments, Anatomical Preparations, and Observations made upon them, the Doctrine of Elasticity, and of Muscular Motion, chiefly depends; and none of them have been made by any one before, nor are they extant in any Author, that I know of.

VI. *On Water, Oil, and Mercury, in the Air-Pump; to prove the Elasticity of Fluids.*

This Experiment, if it ever was made before, was at least never yet applied to prove the Elasticity of Fluids, and shew the immediate Cause of Elasticity, and Cohesion in Solids.

i. *The Elasticity of the Blood-Vessels, and Non-Elasticity of the Nerves, will appear to any, who are disposed to make this Experiment, as I have done, by laying a Piece of Twine, about 4 Inches in Length, parallel to the Nerve, Artery, and Vein of the Inside of the Thigh, in a human Subject; which being tied together above and below, as soon as they are cut out of the Body, and laid on a Board, the Artery and Vein will be seen to contract equally, to the loss of $\frac{2}{3}$ of the Length, which they had in the Body before Excision; as appears in those in Fig 137, the Nerve continuing of the same Length with the Twine, as in the Body.*

Three Lectures on Muscular Motion, read before the R.S. in 1738. by Alex. Stuart, M.D. F.R.S. Supp. to the Year 1738. Lecture I.

The Manner, Explanation, and Use of Exp. I.

Fig. 137.

2. In Dogs the Elasticity is greater, to the loss of $\frac{1}{3}$ of the Length they had before Excision; and as this Elasticity seems to differ in different Species of Animals, so it may vary in the Individuals of the same Species, and in the same Individual in different Stages of Life, or Degrees of Health.

3. The Use of this Experiment is not barely to shew, that the Blood-Vessels are elastic; for every one who knows, that the Artery is dilated in it's Diastole, and contracted in it's Systole, knows it therefore to be elastic in that Sense; and every one, who has performed the Ligature on the Artery after Amputation, knows that it shrinks or shortens it's Axis, and therefore is also elastic in that Sense. But though this be known, yet the Measure or Degree of the Elasticity of an Artery has not, that I know of, been taken Notice of by any body. And, 2^{dly}, As the Vein has no Pulsation, and is never designedly tied in an Amputation, it's Elasticity has been overlooked; though it be equal to that of an Artery in Degree, but not in *momentum*, it's Coats being thinner than those of the Artery. 3^{dly}, The Non-Elasticity of the Nerves has not been so much as once named by any Author, as I remember, before the Publication of my Inaugural *Theses* at Leyden, 1711, where it is remarked, and since that Time by Dr Boerhaave only, in the subsequent Edition of his *Institutions Ann.* 1713, and the two following Editions. But, on the contrary, all the Authors on Muscular Motion, that have come to my Hands, as well as those who have written of the Theory and Practice of Physic, have supposed and ascribed Elasticity to the Nerves.

4. The Experiment therefore is so far useful, as it discovers some essential Properties of these essential Parts, which were not known before; and clears up some Mistakes, that passed for fundamental Truths, relating to the Nerves and Veins, in explaining most Parts of the animal Œconomy, as well as Muscular Motion in general.

5. And it is further very remarkable, that though the Elasticity of the Artery has always been known, and indeed obvious in the Pulsation: yet Authors have been constantly so full of the Elasticity of the Nerves, in explaining not only Muscular Motion, but also several other Parts of the animal Œconomy, and even in accounting for the Symptoms of various Diseases; that they have taken no other Notice of the Elasticity of the Arteries, than solely as it propels the Blood in the Circulation through them: and even in that, by their Doctrine it has been allowed but a very small Share; and by most of them no Share at all.

6. And it may not be amiss to observe, that this Experiment was never made by any, that I know of, till 1711; and afterwards, in 1735, when I first shewed it to this Society. And further, tho' it appears simple and easy to be made, yet it is of the utmost Consequence in all Parts of the animal Œconomy: For as all Parts of the animal body are entirely composed of Nerves, Arteries, and Veins, (excepting the hardest Fibres of the Bones, which also are nourished by them) it is certain that

that all the animal Functions depend upon the Qualities, and Contents of these three Parts. Therefore this Experiment, as it demonstrates the Qualities, and Degrees of the Qualities, of each of these, gives us the Qualities of the Solids in all Parts of the Body; and therefore opens at least one Door towards the Explanation of all the animal Functions, as far as they depend upon the Solids.

1. The next thing which we are to take Notice of, is the Form or Manner of the Distribution of these 3 essential Parts to the various Organs at their Extremities; for upon this Distribution, and the Structure of the Organs, which they lead to, depends the whole Variety of the Functions, whether natural, vital, or animal.

*Explanation
and Uses of
Exp. II.*

2. The Cause, Manner, and Effect, of voluntary Muscular Motion, being a Point that the Founder of these Lectures had chiefly in View, it was necessary to observe the Manner or Order of Distribution of these essential Parts to the Organs of voluntary Motion, the Muscles.

3. For this Purpose therefore I exhibited this Anatomical Preparation, not extant before in any Author, and, so far as I know, not hitherto attempted by any one; namely, the Antagonist Muscles of a human Arm, with all the Nerves, Arteries, and Veins leading to them, entire, as they appear in the Subject itself; and likewise laid before you a very accurate Draught of them, wherein the Arteries are marked red, the Veins blue, and the Nerves white, as in Fig. 140.

Fig. 140.

4. The Uses of this Preparation are various. *1st*. As it shews that there is no Communication between the Antagonist Muscles by their Nerves, each having a peculiar Trunk, or Trunks, and Branches of Nerves distributed to it, distinct from those of it's Antagonist; by which the Mind has a distinct Power over each, and may at Pleasure act upon either, without acting upon the other: for if both were equally acted upon at the same Time, no Motion, but a Rigidity and Immobility, would ensue. *2^{dly}*, This Preparation shews that the Antagonist Muscles have a Communication with one another, by the Intervention of their Blood-Vessels, as there appears to be one Trunk of an Artery, and one Trunk of a Vein, common to both.

5. This seems also to be absolutely necessary towards voluntary Motion, and the Power and Energy of it; to wit, that the acting Muscle may have a greater derivation of Blood into it from the common Trunk of the Artery, than it's Antagonist, which is at that Time to remain passive.

6. Both these very essential Parts of voluntary Muscular Motion must have remained in the Dark, without such an Anatomical Preparation. The mechanical Cause and Manner of this Derivation of an accessory quantity of Blood to the acting Muscles, depends upon this Distribution of the Vessels, and the Mechanism of the muscular Structure, which shall be shewn in the Course of the following Lectures; wherein it will appear,

appear, that the Antagonist Muscles of voluntary Motion are like two Antagonist Scales of a Balance; and that it is in the Power of the Mind, by Means of this, and other Parts of the Muscular Mechanism, not only to throw in a greater Weight at Pleasure into either Scale, but further to throw the Weight taken from the one into the opposite Scale, by which the *Momentum* is doubled on the Side, on which the Mind determines to act.

*The Manner,
Explanation,
and Use of
Exp. III.*

1. This Experiment is performed by laying bare the jugular Vein of a Calf, before it be killed, and separating it carefully from Adhesions; which is then to be tied with a close Ligature; first below near the *Thorax*, and then in the same Manner near the Head, at the Distance of 3 or 4 Inches from the former Ligature, so as that the intermediate Segment of the Vein full of Blood between the Ligatures may be cut off beyond the Ligatures.

2. This Segment of the Vein, turgid with Blood, should be immediately put into a Vessel full of luke-warm or blood-warm Water, to keep the Blood from coagulating within it, which would happen in a few Minutes, if it was exposed to the cold Air.

3. The Vein being taken out of the warm Water, is to be tied to a small square paste-board Frame, and made fast over the Mouth of a Wine or Gelly-Glass, or any such Vessel tapering towards the Bottom, and put into the Recipient of an Air-Pump, which being exhausted, the Vein is to be opened with a Lancet, fixed at the End of a Wire, passing through a Collar of Leathers.

4. The Consequence of this is, that the Blood, which runs out of the Vein into the Vessel set underneath, will be immediately and totally raised up in Air-Bubbles, and thrown out of the Vessel upon the Plate of the Pump, by the Force of the Air which it contained, equally distributed through the whole Mass.

5. By which it appears, that the Blood is greatly stored with Air, as was to be shewn.

*Remarks on
this Experiment.*

Obs. I. §. 1. It is remarkable in the *Apparatus* to this Experiment, that the Heat of luke-warm Water, which is nearly the same with the Heat of Incubation, keeps the Blood in the Vein in a State of Fluidity for some Hours; and I believe it might be kept in that State much longer, which deserves a Trial; this being, as I imagine, the standard Degree of Heat in all such outward Applications, as are intended to dissolve, attenuate, and discuss stagnating animal Fluids, or disobstruct the Vessels: Intentions which are rather hindered than promoted by too hot Baths of Fomentations, in which the mistaken standard Degree is as hot as the Patient can bear it, instead of what he could call a comfortable Warmth, and would be the useful Measure for him. This Degree of Heat would indeed be different to different Persons; but every one would have the due Degree suited to his Temperament, Constitution, and Feeling

Feeling, in which he could not be deceived, being himself the best Judge. Nay even in Mortifications or Sphacelations, though neither this nor any other Degree of Heat can restore Motion in the sphacelated Part, yet this Degree is most likely to promote the Circulation remaining in the Confines of the mortified Part ; which is the only Intention of Fomentations and Poultices in such Cases, in order to a Separation of the sphacelated Sluff.

§. 2. This Doctrine is confirmed by Observations, that all 'Animal Fluids are thickened by any great Degree of Heat, or Cold. Thus,

§. 3. The White of an Egg becomes as hard in a Night's time under the Snow in frosty Weather, as if it had been roasted by the Fire, or boiled in Water ; though the Yolk, being more oily, is not so much hardened in the same Time ; whereas it is known, that all Parts within the Shell are made more fluid by the Heat of Incubation.

§. 4. And hence it is, that the same Kinds of inflammatory Distempers appear in the Summer Heats, as in the greatest Colds of Winter : Whereas the temperate Warmth of the Spring and Autumn is generally healthier, or at least freer from these Kinds of inflammatory Distempers.

Obs. II. §. 1. Though the Vein contains such a Quantity of Air, yet it is no way tumified or expanded by exhausting the Receiver ; which shews, that the real Elasticity of the muscular Fibres of the Vein is superior to the expansive Force of the inclosed Air, in which it's Elasticity is imagined to consist.

§. 2. This elastic Power of the Vessels therefore would make a Rupture of them impossible in an exhausted Receiver of an Air-Pump, or at the Top of a very high Mountain, such as *Teneriff* ; did not the Force of the Circulation, at least in this last Case, contribute to that Rupture of the capillary Vessels ; which appears by spitting of Blood in such Eminences.

Obs. III. The Manner of this Experiment upon Blood, which has never had any Communication with the external Air, obviates an Objection against an Experiment of this Kind, upon Blood received into a Porringer, or other Vessel, from the Arm by Venæsection, which might be supposed to have imbibed or received Air in it's Passage, and Exposition of the external Air, before the Experiment.

Obs. IV. §. 1. As the Blood circulating in the Vessels appears to have such a Quantity of Air intimately mixed with every Molecule, Globule, or Particle of it, the whole Compound, according to the common Doctrine of Elasticity, ought to be looked upon as an elastic Fluid : Even if these Globules themselves were not elastic, as I formerly endeavoured to prove them to be, in an Essay on the Structure and Motion of the Heart, read some Years ago in this illustrious Society, and in a Dissertation *de Struct. & Mot. Musc.* lately published.

§. 2. In the mean Time it may be necessary here to obviate an Objection against the Elasticity of all Fluids, which arises from the Incompressibility, and therefore, as is alleged, the Non-Elasticity of Water, the Basis of all the rest; even though it be known to contain a great Quantity of Air. For this Purpose the *Florentine* Experiment of filling a spherical Vessel of Gold full of Water, closely shut up in it, and exposed to the Strokes of an Hammer on an Anvil, or to any other strong Compression, is offered in Proof. Because in that Experiment it appears, that some Part of the Water will make it's Way through the Pores of the Gold; which plainly shews, that it cannot be compressed into less Room than it had in the spherical Vessel, which is more capacious than the Cavity of an oblate Spheroid, to which the Strokes of the Hammer, or other Compression, may have reduced it.

§. 3. The solving of this Difficulty will give a Handle for clearing up some Mistakes, relating to the imagined Non-Elasticity of Fluids, for which Reason it may not be improper in this Place to give some account of the Nature of Elasticity.

Of Elasticity.

Elasticity being one of the Principles of Muscular Motion, it is necessary to shew where it resides, and how it acts. In order to this, I shall offer the following Propositions, some of which are so evident as to want no Proof, and to the rest the proper Proofs shall be subjoined.

Prop. I. The *Minima* of all Bodies are perfectly hard; that is, their Parts are neither separable, nor capable of changing their relative Situation, by any Power in Nature. This is supported by the incomparable Sir *Isaac Newton*, in his Treatise of Optics, by irrefutable Arguments which I need not here repeat.

Prop. II. Therefore, as the *Minima* of Bodies, cannot be singly elastic, Elasticity must be a Property of compound Bodies only, whose component Parts are capable of changing their relative Situations, and can be drawn to various relative Distances with regard to one another.

Prop. III. §. 1. This Property appears to be greater or less in all compound Bodies, whether solid or fluid; but the Question is chiefly about the Elasticity of Fluids, which has been positively denied in Water (the Basis of all the animal and vegetable Fluids) upon the Score of it's Incompressibility, observed in the *Florentine* Experiment mentioned above. But notwithstanding that Experiment, I believe it may be made to appear, that Water, Oil, and Mercury, are not only elastic themselves, but also the Causes of Elasticity in all compound solid Bodies.

§. 2. In order to this, we are to consider: That the natural State of all elastic Bodies, whether solid or fluid, is Contraction of all the Parts of the Compound towards one another, and to the common Centre of the Mass. This appears in a Bow, and after the same Manner in a Drop of Water, Dew, or Mercury, whose Particles are all equally attracted towards the common Centre of the Mass, even in *Vacuo*, ac-

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cording to Exp. VI. and therefore towards one another, so as to form the exactest Sphere about that Centre, where they remain in *Æquilibrio*, and immoveable by any Power or Force of their own; and if disturbed by any external Force (short of what will dissipate them into lesser Spheres) so as to be reduced to oblate or oblong Spheroids, or to any other Figure different from that of a Sphere, they will immediately upon removal of that Force resume their former spherical Figure, Situation of Parts, and *Æquilibrium* about their common Centre, as before: And in their Progress towards Restitution, they will either repel or constantly endeavour to repel, the incumbent or impelling Force.

Corollary. Thus Fluids appear to be elastic, as they are capable of Extension or Expansion by any external Force applied; and of Restitution to their pristine Figure by their own natural Force, by which they repel, or endeavour to repel, every Thing that stands in the way of their Restitution. Which is the whole Characteristic of elastic Bodies.

Scholium. Repulse therefore (in this Case at least) appears to be no Principle of Action, but the Effect of that Principle, which is rightly called Contraction or centripetal Force; which I have endeavoured to shew elsewhere. [See *Diss. de Str. & Motu Musc. Introd.*]

§. 3. As to the *Florentine* Experiment, which is offered in Contradiction to this Quality in Water, we are to consider, that cold Water is before the Experiment, in the State of it's ultimate Condensation or Contraction which it can have at that Time or Season in which the Experiment is made, with an immediate Contact, or the nearest possible Vicinity of all Parts of the Compound, whose *Minima* are perfectly hard, as has been already proved; and also perfectly round, which it's Fluidity shews to be very probable. Such a Body, I say, in it's natural State of Contraction cannot be brought into a nearer Contact of Parts, nor into a lesser Compass than that of a Sphere, which is the most capacious of all Figures, under the same Surface; and therefore cold Water, or any other Fluid, shut up in a Vessel of that Figure, would either constantly resist the Compression, or escape it even through the Pores of Gold: which no way invalidates the Arguments offered above in Proof of it's Elasticity. For though an elastic Body extended, distended, expanded, or rarified, may be contracted or condensed, either by it's own natural Power, or by an external Force superior to that by which it was extended or rarified; yet it does not from thence follow, that after it's full natural Condensation or Contraction, it can be still further condensed or contracted, by any Force whatsoever: which does not at all imply a want of Elasticity, such as has been above described.

§. 4. It may be further added, that if it was possible to condense any pure elastic solid Body, beyond the ultimate Degree of it's natural Contraction and Condensation, when all extraneous or heterogeneous

neous Bodies are removed ; then we should be able to alter the specific Gravity of Bodies, and so far the Transmutation of Metals would be no longer a Mystery. But there is no known Power in Art or Nature, by which pure Gold, Silver, Mercury, or any other pure homogeneous Metal, can be made denser, or it's specific Gravity increased. It is true, that in impure Metals, by removing the impure or less weighty Particles out of the way of the mutual Contact of their purer Parts, the remaining pure Parts become heavier and denser, than an equal Bulk of the original Mass ; but this is only a Purification, not a Condensation of the primary essential component Particles ; which, was it possible, would alter the specific Gravity, and therefore the Species of the Metal, and so introduce a new Species of pure Metal. Which, I believe, is beyond the Power of Art, or any known Power of Nature.

§. 5. The second Thing to be considered in elastic Bodies, whether solid or fluid, is a Capacity of being extended, distended, expanded, or rarified ; the Effect of which is also to repel any incumbent or impinging Force ; which is sometimes done with very great Violence and Impetuosity in a Direction exactly contrary to the centripetal Force above described, and therefore has been called, though, I think, erroneously, the centrifugal Power of elastic Bodies, observed in various Experiments on the Air, whence it is denominated the most elastic of all Bodies. Of which more hereafter.

§. 6. But I must observe, that the same expansive Power, and even a greater Force of Repulsion, appears in Water, rarified in the *Æolipile* and Fire-Engine ; though it be not allowed to be elastic.

§. 7. But the Truth is, that this Expansion, and Repulse which attends it, do not seem to be natural Powers either of Air or Water ; but Effects produced in them by the Force of Fire, the Rays of the Sun, or Heat, in a Direction contrary to the elastic centripetal natural Powers of these two Fluids : So that Rarification or Expansion in them is not a natural Action of their own, but a forced Effect ; and therefore the Repulse arising from it must also be the same.

§. 8. And this is equally observable in all elastic solid Bodies. For example, a Bow, that lies unbent, cannot be bent by any Force of it's own Elasticity, but by the Impulse of some adventitious external Power, which really extends it, or draws it to a greater Length in the Bending : Therefore the Bow is not then said to act, but to be acted upon, in order to it's subsequent Action of Restitution ; and the Man's Hands and Arms in acting upon it repel whatever stands in the Way of their Action. But this Action and Repulse is never ascribed to the Bow, whose Action is Restitution, or a centripetal Motion only, by which the Arrow is projected by Repulse, or Reaction of the Bow upon it in it's Restitution or Contraction.

§. 9. It

§. 9. It is in the same Manner, that the Rays of the Sun, Fire, or Heat, expand and rarify condensed Air, or Water, and repel whatever stands in the Way of their Action, and that *Undequaque* in the manner of all other Fluids; in which Action the Velocity of the Particles of Fire, communicated to the Particles of a weightier Fluid than itself, increases the *Momentum* of the Expansion and Repulse, in Proportion to the different Weights of the Fluid acted upon: Therefore the Force of this Expansion and Repulse is found to be far greater in rarified Water or Steam, than in rarified Air; as is evident in the *Æolipile* and Fire-Engine.

§. 10. Thus it appears, that this Expansion and Repulse is not owing to the natural Elasticity of the Air, but to a foreign Power, to wit, that of Fire or Heat acting upon it.

§. 11. And this is confirmed by observing, that Air long shut up from the Rays of the Sun, and from all Communication with the external Air, which conveys them: I say such imprisoned Air at last totally loses this expansive Power, so as to become unfit for Respiration, and will extinguish a Flame, or kill an Animal, as quickly as if they were stifled in *Vacuo*. Which indeed is the Case. Whence it is commonly, but I think, wrongly said, that such Air has lost it's Elasticity. As if we should say, that a Bow has lost it's Elasticity, because we see it lie still, contracted, or unbent, and no Hand employed to extend, that is, to bend it; without considering, that no elastic Body can act until it be first acted upon.

I shall proceed to consider these Instances a little further, in the next Lecture, together with some other sensible Properties of Fluids; that by comparing them we may be able to draw such general Conclusions for our Purpose, as shall appear to flow necessarily from them, in Confirmation of what has been already said, and for a further Illustration of this Subject.

Section 1. There appears to be only 4 kinds of Fluids, visible and obvious to the Touch, namely Water or watery Fluids, Oil, Mercury, and Fire; the last of which, though the most universal and most powerful of all, we are certainly the least acquainted with. Lecture II.

§. 2. The Air as it is not a visible Fluid, and is known to be an heterogeneous Mixture of almost all sorts of Fluids; until we are at some Certainty about the Properties of the other more simple and more sensible Fluids, of which it is composed, it is not likely that we can come to any solid Conclusions concerning it: Therefore this may more usefully be the Subject of some following Lectures.

§. 3. The first Property that I have already touched upon in Water, is, that the minuteft, visible, distinct Drops of it, and even pretty large ones, as well in *Vacuo* as in the open Air, (according to Exp. VI. made) form themselves into exact Spheres; in each of which the Centre of Magnitude appears to be the Centre of Gravity, Attraction, and

and *Æquilibration*, as also of Vibration or Elasticity. And in such small Drops it continues to be so, as long as the Attraction of each Particle of the Fluid within that Sphere is greater towards it's own Centre, than towards the Centre of the Earth: That is, until the Drop is so increased, that the Gravity of the extreme Particles of it's Surface exceeds their Attraction towards the Centre of the Drop, as placed at too great a Distance from it, to be sensibly or sufficiently affected by it. In which Case, though they do not lose their mutual Attraction towards each other, and therefore retain a proportional Attraction towards their common Centre; yet they are forced to yeild to the superior Power of Gravity, by which they form themselves into a small Part or Section of a larger Sphere, about that more powerful Centre of the Earth. This is most remarkable in the Ocean, where the Water affects and obtains the same spherical Figure about the Centre of the Earth, as the least Drops do about their own peculiar Centres.

§. 4. And this Attraction of it's Particles in *Æquilibrio* towards the common Centre of each small Drop, is distinct from, and independent of, the Action of the Specific Gravity of the whole Drop towards the Centre of the Earth, the one being no ways hindered or promoted by the Action of the other; which appears by the constant Sphericity of their Figure, whether they ascend in Steam or Vapour, descend in Rain or Dew, are suspended in a Fog, or lie or hang on the Leaves of Grass; either in the open Air, or in *Vacuo*.

Corollary. Therefore the same hydrostatical Laws, which take Place in the Ocean, or any other considerable Collection of Water, whose Surface forms itself to a Convexity about the Centre of the Earth, must equally take Place in every distinct Drop of Water, whose Surface forms itself to a Convexity about it's own peculiar Centre. And such of these Laws, as may serve for our present Purpose, shall be taken notice of in the Sequel.

§. 5. The second Property that I would take Notice of in Water, is, that it is very plentifully attracted into the Pores, Vessels, Interstices, and innermost Recesses of all Solid, Animal, Vegetable, and Terrestraneous Substances, where it diffuses itself equally, and uniformly, *quaquaversum*; and constitutes in some one half, but in the greatest Number more than half of their Bulk or Weight: to say nothing of Tin, Antimony, Sulphur, and some other mineral Substances, where it is also found; for which the Chymists may be consulted, and particularly Dr *Boerhaave*, in his Treatise of the Elements of Chymistry.

§. 6. I shall only offer one remarkable Instance of this in Exp. IV. made on a Species of *Tblaspi*, commonly called the *Rose of Jericho*, *Rosa Hierichontea*, which in it's vegetating State spreads it's Branches all round, almost horizontally, from the Top of the Root, near the Ground, as from a Centre: When it has perfected it's Seeds, it appears

of a hard woody Contexture; and as it grows dry, the Branches contract and curl themselves up towards their Centre, so as to form a spherical Figure: in which State this Plant weighed 7 Drachms and a few Grains; but after having been steeped 2 Hours in luke-warm Water, it expanded it's Branches as you see; and it weighs now 13 Drachms, which is but one Drachm less than the double of it's former Weight in it's dry State: How much more Water then, or watery Juice, must it have contained in it's green and growing State? Fig. 139.

§. 7. Some green Plants indeed contain more Juice than others, but almost in all of them, when pounded and squeezed, the Juice is found greatly to exceed the husky or dry Part. This Excess of the Fluids in Vegetables is exceedingly remarkable in all the Succulent kinds, and is little or nothing less in living Animals, and recent Animal Substances; Experiments having shewn, that after Waste or Expulsion of all the Fluids by Desiccation, or Distillation, the remaining solid Parts appear to bear a very small Proportion to the Fluids.

Corollary. Therefore the few rigid and less moveable Solids in all Animal and Vegetable Substances must in Action yield to, and be governed by, the Hydrostatical and Hydraulic Laws of the Fluids, so plentifully contained in them; as that which has the greatest *Momentum*, arising from it's Weight and Celerity, will in all Motions overpower what has less.

§. 8. This is in a good Measure remarkable in the *Heath Rose* just now shewn, where the Force of the Fluids, tho' urged on by no other Power than the Attraction of it's small Pores and capillary Tubes, was sufficient to expand and extend the Branches, and Vessels of which they are composed, from being Segments of lesser to form Segments of much larger Circumferences of Circles, or other Curves; which no external Force can do, without breaking them to Pieces.

§. 9. This Experiment serves also to prove and illustrate, what I have advanced elsewhere, concerning the Power of the Blood propelled alternately by the Force of the Heart and Arteries into the Branches of the Blood-Vessels, investing the Cavities of the Intestines and Vesicles of the Lungs, for forwarding the Diastole or Expansion of these Cavities in the peristaltic Motion and Inspiration; to wit, by a Force in the Direction of the Tangents of the Arches of these Vessels and Cavities, which is a Direction perpendicular to their centripetal elastic Contractions; as they appear in Draughts of the Intestines and Vesicles of the Lungs. See *Diff. de. Struct. & Motu Musc.* Tab. II. Fig. 1, 2, 3. and Tab. V. Fig. 5.

§. 10. The third Property observable in Water is, that it is the Cement of Union of the solid Parts in all Animal, Vegetable, and Terrestrous Substances. A Paradox, which nothing but Experience could render probable; to wit, that a fluctuating Body, whose Parts may be so easily disturbed, displaced, or separated, should give Firmness, Hardness, Rigidity, and Stability, and prove a *Copula* of Union to

to other Particles of a Mass, which could never unite among themselves without it. Yet this is obvious in making of Bricks, Mortar, and Figures in Plaister of *Paris*, and also in the Distillation and Calcination of all Vegetable and Animal Substances; where, after the total Expulsion of all the Fluids, nothing remains but incoherent loose Dust or Ashes, incapable of uniting again without a new Recruit of Moisture.

§. 11. The fourth Property of Water is, it's being the universal Dissolvent of all these very Substances, of which in the preceding Section it is observed to be the Cement. Which also at first Sight seems another Paradox; because to unite, and divide, are evidently two contrary Actions. I shall therefore in the Sequel endeavour to shew, how consistently they flow from one and the same Principle, acting by the same Instrument.

§. 12. The fifth very remarkable Property of Water and other Fluids is, that they are capable not only of an Alteration of Figure, or different Position of Parts, without the loss of Contiguity, as has been said already; but are also liable to have their Parts separated to small Distances by Expansion or Rarification, or to greater Distances by Evaporation or Dissipation; which is evident in Water, Spirit of Wine, Oil, Mercury, and all other kinds of Fluids exposed to the Fire, or Heat, of any sort. In which Circumstances they very forcibly, and in some Cases almost irresistibly, repel every moveable thing, that stands in the way of their Expansion or Evaporation, even to the Pitch of Explosion at the Places of least Resistance: as appears in the *Æolipile* and Fire-Engine.

§. 13. The Principles from whence this expansive Power and Repulse arise have been mentioned already. I shall now apply what has been said in this, and the former Lecture, towards a further Explanation of the universal Elasticity both of Fluids and Solids.

§. 14. 1st. It has been generally supposed, that when the solid Particles of an elastic Body are drawn out of Contact to some very small Distance by Extension, they have a Power of restoring themselves to their former Contacts again by their mutual Attraction; in which the Elasticity of compound solid Bodies has been said to consist. But if we may depend upon what is visible, we shall never see the dry solid Fibres or Particles of any solid Body, once divided or drawn out of Contact, coalesce or unite again, or recover the close Contacts they had before; without some fluid Medium superadded. And therefore if the least Fibre of a Bow, or other elastic solid dead Body, be once cracked or broken, the Rupture will always continue the same; and notwithstanding the Elasticity remaining in the other Parts of the Bow, by which the broken or divided Parts are brought again within the same Bounds of Vicinity through which this attractive Power is said to extend, nevertheless they do not again coalesce or cohere.

§. 15. It is further observable, that if a Drop of Water, Oil, or Mercury, be divided into many lesser Drops, and placed at the least imaginable Distance from mutual Contact, they always remain distinct and disunited; but upon Contact they are absorbed into each other with a visible Rapidity, and become one as before.

Corollary. Therefore there is some Reason to conclude, That the Power of Attraction does not reach much, if at all, beyond Contact, either mediate or immediate; and that it takes Effect in Solids only by the Mediation of Fluids. Again, it is apparent, that within the Limits of Contact it is very sensibly strong in Fluids.

§. 16. This Quality in Fluids with their Capacity of Change of Figure, or Disposition of Parts in the Mass, to every imaginable Shape, without a Solution of Continuity or Contiguity; and with a Power of returning to their pristine Figure, or Disposition of Parts, within their former Surface again, when left to themselves; these Qualities, I say, are sufficient to establish Elasticity as a natural and essential Property of Fluids, not discoverable in pure or simple Solids, without their Mediation or Assistance.

§. 17. For by what has been said of solid Bodies, when destitute of all Humidity, or deprived of all their Fluids, it appears evidently, that none of the aforesaid Qualities can belong to them; and therefore as Solids they can have no Elasticity of their own, nor any Degree of it, but what is borrowed from the Fluids they contain. An Instance of this is in the Artery before you, whose Elasticity while recent and moist was shewn before in the first Experiment; but being now dried is neither capable of Extension or Distention, but remains rigid and contracted, until it be steeped again some Hours in Water, by which it will recover it's former Elasticity.

§. 18. If Elasticity therefore resides solely in Fluids, and only by their Intervention in Solids, we are now to consider how, and with what Force, or *Momentum*, it acts there.

§. 19. Elasticity then, at least in Animal and Vegetable Substances, being an essential Property of their Fluids, and of them only, the Laws of Elasticity and Hydrostatics must be the same, these last arising from the Nature of Fluids, as well as the first; and there can be no Incongruity, Contradiction, or Inconsistency in the same Nature or Essence: therefore the known Hydrostatical Laws will give us the Laws of Elasticity, which must take place equally *in minimis ut in maximis*, in a Drop of Water as in the Ocean.

§. 20. It is a general Law in Hydrostatics, that the Pressure of Fluids is in Proportion to their Altitude or Height, and the Surface against which they press; and not in Proportion to their Breadth.

§. 21. Another general Law is, that in the same Altitude they press equally in all Directions, or *quaquaversum*.

§. 22. From these 2 general Laws arises another special one, which is commonly called an Hydrostatical Paradox: to wit, that a Cylinder

of Water of any given Height, communicating with a Vessel set under it of any given Diameter larger than it's own, and full of the same Fluid, presses upon the Bottom, Sides, and Cover of that Vessel, with a Force equal to the Weight of a Cylinder of Water of the Height of that Cylinder, and of the Diameter of the underset Vessel; and, if the Vessel be distensible, it will distend it, or enlarge it's Cavity by all that Force; which may be indefinitely greater than the Weight of the whole Water, contained both in the Vessel and in the Cylinder: which mechanical Disposition of the Fluid produces a great Multiplication of Power, in Proportion to the Height of the Cylinder, and Breadth or Diameter of the communicating underset Vessel.

§. 23. Let us then only for the present suppose, what seems highly probable, that the Pores and Interstices, at least, of Solid, Animal, and Vegetable Bodies are round, as their Vessels are known to be cylindrical; and that the Water every Drop of which tends naturally to Sphericity, being attracted into them, is lodged there in small *Spherules* or *Cylinders*; this being the contracted Shape, which they naturally take, as comprehending most Matter within the least Surface. Now if the solid Body, containing them in it's Pores or Vessels, be drawn, bent, or extended to a larger Surface, containing the same quantity of Matter, the Fluids in it must yield to that Force; and therefore each Drop must take some Figure different from that of a Sphere, or become a Cylinder of a lesser Diameter; that is, it's Surface must be extended or expanded, so as to become an oblate or oblong Spheroid; or it must take some other Figure different from that of a Sphere, and adapted to the Figure, which the Pores and Interstices of the Solids or the Vessels themselves are reduced to by the Extension. But so soon as the bending or extending Force ceases, and the whole solid Body is left to itself, the Particles of each Drop will endeavour to recover their *Æquilibrium* about their peculiar Centres, whereby they recover their Sphericity, or Contraction, again into the least possible spherical or cylindrical Space; by which the Restitution in every Part, and therefore of the whole, is performed, the contiguous Solids yielding to, and conspiring with, the *Momentum* of the Fluids in this Action.

§. 24. But for the sake of Illustration only, let us again suppose a thing less probable: to wit, that by the Extension of the containing Solid a Part of each distinct Drop should be raised beyond the Surface, in the shape of a small Cylinder, by which the Diameter of the Drop would be lessened; this small Cylinder then would press towards the Centre, and all Sides of the Drop, with the same Force mentioned in *Section 22*; and in the Restitution the Diameter of the Drop would increase proportionally, as the Length of the Cylinder in it's Descent or Accession towards the Centre of the Drop decreased: therefore it would descend or accede to that Centre by a Motion uniformly accelerated; as in Gravity. And in this view we have Gravity and Elasticity arising from one and the same Principle.

§. 25. But

§. 25. But the same Argument will hold, and the same Conclusion will follow, upon the other more probable Supposition: to wit, if by the Extension of the solid containing Body, mentioned before, each distinct Drop be supposed to be drawn from it's Sphericity into an oblong Spheroid, or pressed to the Form of an oblate one; for the Restitution in both Cases will produce the same Effect from the same Hydrostatical Principles, since whatever Part of the Fluid is extended beyond the Bounds of it's former spherical Surface, will thereby have an increased Pressure towards the Centre, such as the Cylinder has been said to have, or in such a *Ratio*: because the Rays terminating in the uncompressed Parts of the Surface of the oblong or oblate Spheroids of Fluids, are lengthened by the new Accession of Particles from the compressed Sides, by which the Pressure towards the Centre in such lengthened Lines will be increased, in Proportion to their Lengths; and the shorter Diameters of each *Spheroid* will be proportionally lengthened, as these Lines in acceding to the Centre are shortened: that is, the Particles, which lie in the Direction of the longer Diameters of the *Spheroid*, in the Restitution will accede towards the Centre, with a Motion uniformly accelerated, as in Gravity. The same will be true of a Cylinder, whose Diameter is shortened, and it's Axis lengthened, by the Compression or Extension.

Corollary. Therefore the Laws of Gravity, Hydrostatics, and Elasticity, are probably the same, and arise from the same Principle of central Attraction, only diversified in almost an Infinity of *Phænomena* both natural and artificial, by the Diversity of Centres, Circumstances, and different Qualities of the Bodies acted upon.

§. 26. And this Conclusion seems to be corroborated by the Vith Experiment made at last Meeting, on Water, Oil, and Mercury, in which it was apparent, that the centripetal Force of these distinct Fluids differed one from another in the Proportion of their specific Gravities. The Drop of Mercury, as the heaviest, formed the most perfect Sphere about it's own Centre, and the least; the Drop of Water, though spherical, touched the Plain in more Points; and the Oil, though it's upper Surface was spherical, lay much flatter on the Plain, forming as it were a Section of a small Sphere. Therefore the centripetal Force in each was proportional to it's specific Gravity; which seems to shew, that it flows from the same Principle, acting on the same Subject always with the same Degree of Force, only on each Species to a different Centre with a different Degree of Force or *Momentum*; whereas, if the centripetal Force in each of these Drops did arise from some other Principle than that of Gravity, it might be stronger in the lightest than in the heavier Fluids. For as Gravity is a Power which acts equally on all Bodies in the *Ratio* of their Contents, if this centripetal Power, being equal in all Bodies, was in some other *Ratio* or Proportion, than that of their Contents; then it would act most strongly and sensibly on the lightest Fluid, whose Gravity

and Contents could least resist it's Force : And therefore the Drop of Oil would form a perfecter Sphere, than the Mercury ; the Reverse of which appeared in the Experiment.

§. 27. Another Thing that I would suggest from the Experiment is, that if a Drop of each of these 3 Fluids could be taken equal one to another in Weight, the Cubes of the Diameters of the Spheres formed by them would be one to another reciprocally as their specific Gravities ; in the same Manner as the Spaces they take up in the same cylindrical Vessel are reciprocally as their specific Gravities. Which confirms the former Conclusion, that this centripetal Power in Fluids, and therefore their Elasticity arising from it, does not differ from Gravity, and is governed by the same Laws ; producing a Motion uniformly accelerated, as in the Descent of heavy Bodies.

Corollary. Therefore the Laws of Gravity, Elasticity, and Hydrostatics, are the same ; and arise from the same Principle.

Having thus endeavoured to prove, that Water and watery Fluids are not only elastic themselves, but also the immediate Cause of the Elasticity of all Animal, Vegetable, and Terrestrial solid Substances, of whose Composition they make a very considerable Part ; it is now incumbent to shew, how it's other seemingly contrary Properties, formerly mentioned, are reconcilable one with another, and also with this essential Property of Elasticity : Particularly how Water and watery Fluids can prove the Cement, and likewise the Dissolvents of Animal and Vegetable, and also of many Terrene Bodies : Or can become the Causes of so very different and even contrary Effects, as to unite and divide the Parts of the same Subject ; and this by that single Property of central Attraction.

In order to the easier Illustration of this, I would offer the following Propositions, which are either evident of themselves, and universally acknowledged, or founded upon Experiments, or proved in this and the preceding Lecture.

Prop. I. There is a natural centripetal Power in Water, and indeed in all other Fluids, by which every distinct Drop, or certain small Quantity, left to itself, gains and retains an exact Sphericity. This I hope has sufficiently appeared by the Observations and Experiments already made.

Prop. II. The Degrees of the Intensity of Powers propagated in Rays from a Centre, or impelled in a contrary Direction towards the Centre, are found to be reciprocally, as the Squares of the Distances from the Centres of the respective Spheres of their Activity.

Con. Therefore as Water appears to have such a centripetal Power, it follows, that the extreme or superficial Particles of the smallest Drop of Water press towards one another, and towards their common Centre, more strongly, than the superficial Particles of a larger Drop, or of the same Drop, augmented to a larger Size by the Accession of more Water.

Prop. III.

Prop. III. There is an universal Impenetrability in Matter, so that one Quantity cannot take place, without dislodging another of equal Bulk or Surface.

Prop. IV. And in this Action, that which has the greater *Momentum* will overcome or displace that which has less.

Prop. V. The Quantity and Celerity, or *Momentum*, of a Fluid in Motion may be such, as to overcome the Resistance of Solids at Rest.

Prop. VI. Water and other Fluids in Contact with Solids, acquire a Degree of Motion by Attraction into their Pores, capillary Tubes, and Interstices, even to their innermost Recesses, so as to swell, extend, or expand them. Instances of this were shewn in the *Rose of Jericho*, and in a human Artery.

Prop. VII. And the Degree of Attraction of the same Species of Fluids into the same Kind of Solid being always equally the same, the Celerity of the Motion arising from it will also be always the same. Therefore the Increase of the *Momentum* of the Fluid in this Action must arise from the Increase of the Quantity of the Fluid so absorbed; which may therefore be accumulated not only to the Pitch of Extension, Expansion, and Softness, but even to a perfect Solution. Which all Observations confirm.

§. 28. These Propositions being admitted, it will appear, that the Cohesion of Solids in their various degrees of Hardness, Solidity, Rigidity, or less sensible Elasticity, manifest Elasticity and Softness; and also their perfect Solution, even to the State of Fluidity, do all arise purely from the different Quantity of Water, or other Fluids, lodged in their Pores, or between their solid Particles.

§. 29. Thus the incoherent Dust of dry Clay, and fine Gravel, by a considerable Quantity of Water added in making of Bricks, become a soft ductile kind of Paste, *Prop. VII.* but by losing a great deal of this Moisture in drying, or baking, becomes a hard solid Mass. In which nevertheless a considerable Quantity of Water still remains in distinct Drops, lessened in their Size by the Evaporation, and therefore having their remaining Particles more strongly attracted to their respective Centres, and one to another; and consequently producing a stronger Adhesion of the contiguous solid Particles to the Pitch of Hardness, Rigidity, and a less sensible Degree of Elasticity. As in *Cor. Prop. II.*

§. 30. This also appears for the same Reason in dried Lime-Mortar, and Plaster of *Paris*; and must be the same in the natural Concretions of common Stones, Marble, &c. in all which the Moisture has been by Degrees evaporated to their specific Pitch of Hardness. And hence it is that all Quarry Stones, by being exposed to the open Air for some Time, become gradually harder, than when they were cut out of the Quarry.

§. 31. But when the remaining Moisture is farther or totally expelled by the Force of Fire, they return to their original incoherent Dust, dry Powder, or Lime.

§. 32. So that the Cohesion of Parts in Solids of this Kind to the Pitch of Hardness, Rigidity, or less sensible Elasticity, arises from the Smallness of the Spherules or Drops of Water interspersed in their Pores; which makes them less capable of Extension, Dilatation, or sensible Elasticity. See *Cor. Prop. II.*

§. 33. The same appears in dry Wood, and other vegetable solid Substances; and in the dry Bones, Horns, and Nails of Animals; whose Hardness or Rigidity is owing to their Desiccation, or to the Evaporation of a certain Proportion of their Moisture; the remaining small Portion making the Solids in them cohere more strongly, for the Reasons mentioned in the same *Prop. II.*

§. 34. And when this Remainder is also expelled by the Force of Fire, having lost the *Copula* of Union, they fall to Dust and Ashes.

§. 35. Or if the Proportion of Water be greatly increased by Infusion, Maceration, or Decoction, they are brought to a Softness or Solution by the *Momentum* of the increased Fluid. As in *Prop. VII.*

§. 36. This is farther evident in the making Glue of the dry Skins of Beasts, and of Fishes; and Paste of Starch; whose agglutinating Quality is owing solely to the Proportions of Water absorbed, or intermixed by Infusion, Maceration, or Decoction.

§. 37. Again, a certain greater Proportion of Water or watery Fluids, than is found in these dry Substances mentioned above (observable in the green Twigs and Branches of Trees, and other Vegetables; and in the fresh Arteries, Veins, and other recent Parts of Animals) produces a sensible Elasticity, easily to be brought into Action; because the larger Molecules or Drops of the interspersed Fluids by a lesser or weaker *Nisus* of their extreme Particles one to another, and to their respective Centres, admit an easier Change of Figure in the Bending or Extension, and thereby gain a more sensible Motion in their Restitution. That is, by this greater Proportion of Fluids in their Pores and Vessels, they become more sensibly elastic. As in *Cor. Prop. II.*

§. 38. But if this Proportion of Fluids be farther increased, all these Substances become soft and pulpy, and thereby lose their Elasticity; because the interspersed Molecules of the Fluids are now so large, that the Particles of their extreme Surfaces, contiguous to the solid Parts of the Compound, are less attracted towards their Centres, and therefore upon Change of Figure are incapable of restoring themselves. That is, by a redundant Moisture their Elasticity is lost, and they become soft; they fall into a degree of Solution, or the lowest degree of Fluidity. See *Prop. VI. and VII.*

§. 39. And if this Proportion of Fluids be yet more or greatly increased, the Solid is completely dissolved, (See *Prop. III. V. and VII.*)

VII.) it's solid Particles being repelled, or driven asunder by the Interposition of a copious Fluid, as by so many Wedges succeeding one another, increasing in Bulk, and impelled by Attraction, the prime Spring of Motion in all Solutions, Fermentations, and Putrefactions; but as this opens a very large Field of Disquisition, which would lead us too far from the Purpose of these Lectures, it must therefore be left to some other Opportunity.

§. 40. Thus the seemingly contrary or repugnant Properties of Water and other Fluids in cementing and dissolving, hardening and softening, as well as communicating Elasticity to Solids, are reconciled; as arising from the same Principle of central Attraction, producing different and even contrary Effects, by it's different Degrees of Force, in different Proportions of the Fluid.

§. 41. By which it also appears, that there is no such Principle in Nature, as a centrifugal Power: But that Repulse (at least in all these Phenomena) ariseth from the Principle of central Attraction in the Retitution to Equilibration; and from the Impenetrability of Matter; and the superior Momentum of an increased Fluid, forced into Action by the same Attraction: And therefore that it is no natural Principle, but a forced Effect, which was to be proved. See Prop. III. IV. V. VI. VII.

This Lecture, which is to be the last for this Season, contains an Lecture III. Explanation of Exp. V. and a short Abstract of a general Scheme of Muscular Motion, which may lead us, without wandering from the Purpose of these Lectures, through the whole Animal Economy: In which the Principle of Elasticity, which I have been endeavouring to explain in the former Lectures, bears so great a Share, as it does indeed in other innumerable and surprizing Phenomena of Nature; the centripetal Power, from whence it ariseth, seeming to be, next to immaterial Impulse, the inexhaustible Source of all Motion in the Universe.

1st, This Experiment is performed by suspending a live Frog by the fore Legs in a Frame, or in any other commodious Manner, The Manner, Explanation, and Use of Exp. V. Fig. 143. Fig. 143. when having cut off the Head from the first Vertebre of the Neck with a Pair of Scissars, a small Probe, the Button at it's Extremity being first filed flat, is to be pushed very gently down upon the upper Extremity of the *Medulla Spinalis*, in the first Vertebre of the Neck; upon which the inferior Limbs, which hung down loose, will be immediately contracted, as they appear in Fig. 144. The same Fig. 144. Probe pushed gently through the Hole of the Occiput of the Skull on the *Medulla Oblongata*, will make the Eyes move, and sometimes the Mouth to open.

2^{dly}, The same being repeated at some small Interval of a few Seconds, succeeds for several Times in the same Manner; until the Extremity of the spinal Marrow be either pushed down too far out of the reach of the Probe, or contused by it, which last Effect appears

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soonest on the *Medulla Oblongata* : But after this the Experiment will not farther succeed, the Compression then ceasing to be equal or uniform.

Observations
on this Experiment

Obs. 1. It must be observed, that this Experiment succeeds better in the Summer Months some Time after the Frogs have spawned, than it does early in the Spring, or in Winter when those Creatures are almost dead by Cold, and want of Food.

Obs. 2. The Interval of a few Seconds in repeating this Experiment on the same Frog, seems to be necessary for recovering the Equality of the Circulation, which was disturbed by the immediate preceding Convulsion, as it throws the Blood violently out of the Muscles in the Time of their Contraction, or Systole, which cannot be restored immediately in such a languid State of Circulation, as this Experiment must bring on ; and as the Assistance of the Blood will appear by the following Scheme to be necessary to Muscular Motion, where it is deficient, the Motion must also be defective or imperfect, as it appears in repeating the Pushes too quick.

Obs. 3. As the inferior Process of the Brain, called the *Medulla Oblongata*, and it's Continuation called the spinal Marrow, are only a continued or prolonged Collection of the Nerves arising from the Brain and *Cerebellum* ; by this Experiment it appears, that the Nerves contribute remarkably to Muscular Motion ; and that their Assistance in it is owing to the Fluid they contain, I have endeavoured to prove, by shewing the Non-Elasticity of the Nerves in the first Experiment.

Obs. 4. The Motion here excited is in the Muscles of voluntary or spontaneous Motion, which are under the command of the Will.

Obs. 5. The Effect of the Impulse by the Probe is the same, which is or may be produced in these Muscles by the Mind or Will ; or is the very same in it's Manner as voluntary or spontaneous Motion, and performed by Mediation of the same Instruments, to wit, the Animal Spirits, or Fluid of the Nerves, and the Muscles of voluntary Motion.

Obs. 6. The Extremity of the Probe applied in this Experiment being flat, cannot produce this Effect by Irritation, but by Compression ; and the Compression of the pliable Extremities of Tubes full of any Fluid, must depress or propel the contained Fluid towards the lower or opposite Extremities, with an increased Degree of Velocity. Therefore at least the Beginning of this Motion may be justly ascribed to a Propulsion of a small Quantity of the contained Fluid, through these slender Canals into the Muscles, in which they terminate, with some greater Degree of Velocity, and in some greater Quantity than usual. Whence we may conclude, that voluntary Muscular Motion in a living Animal is begun in the same Manner, by an Impulse of the Mind or Will on the Animal Spirits through the Nerves, into the Muscles.

Cor. And

Cor. And as the Quantity of Animal Spirits propelled into the Muscles in this Experiment must be supposed very small; it follows, that the Waste of this Fluid, by moderate voluntary Motion in Life, is very inconsiderable, or little more than what arises from the common Course of the Circulation, moderately promoted by easy Exercise, and useful for Health.

Obs. 7. In the following short Abstract of a general Scheme of Muscular Motion, the Structure of a Muscular Fibre is supposed vesicular, with a reticular *Plexus* of Blood-Vessels investing each Vesicle; which is confirmed by an universal Analogy in the Structure of all the moving Parts in the Animal *Œconomy*, visible in the Heart, Lungs, Stomach, Intestines, urinary Bladder, &c. whose Motions consist in an alternate *Systole* and *Diastole*. Therefore the Nature and Manner of the Muscular Motion produced in this Experiment must be the same, while the Heart continues to beat, and the Blood to circulate in the Limbs, in the same Manner, though not with the same Force, as before the Experiment. Which will be farther explained in the following Scheme.

The Order of accounting for Muscular Motion consists in assigning, 1. The Principles. 2. The immediate Cause or Causes. 3. The Instruments. 4. The manner of Action, or *Modus*. 5. The Effects of it.

An Abstract of a general Scheme of Muscular Motion. See Diff. de Struct. & Mot. Musc.

1. The Principles or Sources of all Motion whether Natural or Artificial, are only two; Impulse, and centripetal Power.

2. Original Impulse, and therefore every new Motion, must arise from some immaterial Being, as it's immediate Cause. *Diff. de Struct. & Motu Musc. Cap. 1.*

3. Impulse, as the Beginning of every new Muscular Motion, is in the Power of the Mind or Will, which must therefore be an immaterial Being. *Diff. de Struct. & Motu Musc. Cap. 2. 5.*

4. Centripetal Power, or the Power of Contraction, is the most universal Principle in Nature, producing Repulse; and is properly the Elasticity of the Instruments in Muscular Motion.

Schol. 1. Inquiries into the intermediate Cause or Causes of this universal centripetal Power, of which Elasticity is only one Branch, are not to be dropt, or neglected; but after all our Researches and Discoveries we shall be forced at last to acknowledge, that at the Origin of the Chain of Natural Causes, in all it's real or imaginary Length, there must be an omnipresent and immaterial Agent as the prime Cause.

Schol. 2. In the mean Time, in many *Phænomena* of Nature it is much to be doubted, whether that Chain be so long as is generally imagined; and whether God himself be not the immediate, acting, ubiquitary Cause of centripetal Power; which seems to be the immediate Cause of all the *Phænomena* of Nature; the indefinite Variety of them appearing to arise only from the different Structure of the Machines

chines or Instruments, and other Circumstances of Action. And it is evident, that all those *Phænomena*, which by some of the ancient Philosophers have been attributed to a *Fuga Vacui*, arise from a perpetual *Nifus* to Equilibration, the ultimate Aim of Nature, and the immediate Effect of this centripetal Power.

And though this universal centripetal Power was to be admitted as the *ne plus ultra* in the Line of Causes or Principles, (which I do not ways pretend to determine) and was to be resolved into the immediate and ubiquitary Agency of God as the prime Mover; this would nevertheless be far from putting an end to all further Disquisitions, or Inquiries in Natural Philosophy; as some may have inadvertently apprehended: For there would be still an almost infinite Work behind, for exercising all the Faculties of the Mind, in explaining the innumerable Varieties of the *Phænomena* or Effects arising from this Principle. We should still be far from knowing all its Laws of Motion, all the Degrees of its Force, and the indefinite Variety of its Directions in the innumerable Productions of Nature, with all their various Structures; which would still remain the inexhaustible Subjects of Inquiry in Natural Philosophy; by unfolding of which, she would not only nominally, but really, become the Mistress of all Arts and Sciences; the former being only Imitations of the Works and Designs of Nature, and the latter the Doctrine or Explanations of the same Works, whether Physical or Moral. But to return from this Digression.

5. The universal Instrument of all Animal Motion is a Muscle. *Diff. Cap. 3.*

6. No other Vessels are observed to enter into, or to make a Part of the Composition of a Muscle, but Nerves and Blood-Vessels; therefore a Muscle, or the compound Instrument of all Animal Motion, must be made up of these only. *Diff. Cap. 4. & Conclus.*

7. The Nerves are not elastic, but serve to convey an aqueous Fluid, called the Animal Spirits, from the Brain, *Cerebellum* or spinal Marrow, to the Muscles. *Diff. Cap. 5, 6.* Which Fluid is the immediate Subject of Impulse, or the immediate Instrument of the Mind for beginning Muscular Motion. As appeared by Experiment V. made on a Frog.

8. The Blood-Vessels and Blood are elastic; whence the centripetal Power, or Contraction and Repulse in Muscular Motion. *Diff. Cap. 6.*

9. The external Distribution of the Nerves and Blood-Vessels to the antagonist Muscles formerly exhibited shews, that each Antagonist has its distinct Nerve or Nerves without Communication; but the antagonist Muscles communicate one with another by one common Trunk of an Artery, and one common Trunk of a Vein: So that they are like two antagonist Scales in *Æquilibrio*, over which the Mind has a distinct Power by distinct Nerves for determining the Animal Spirits, and thereby the Blood, to either side at pleasure, without affecting the other.

Fig. 140.

10. The

10. The internal Disposition of these Vessels in the Composition of this Instrument is taken from the universal Analogy, visible in all the moving Parts of the animal Machine: To wit, the Heart, Lungs, Intestines, Urinary Bladder, &c. wherein such a Structure appears to the naked Eye, as gives us the following Idea of the smallest Muscular Fibre, described in *Diff. Cap. 8.* that is, a nervous Fibre produced from its Entrance into the Muscle along or in the Axis of each carnosus Fibre, in the Form of a Chain of distensile Vesicles, whose Sides are covered with a Net-Work of elastic longitudinal and transverse Blood-Vessels; the Extremities of all these Nerves compacted forming the Tendon, which being spread out or expanded again, forms the Periosteum. See Fig. 2. and 3. Tab. 2.

11. By the naked Eye, or with the help of a Microscope, this smallest Muscular Fibre appears of the same blood-red Colour, and of the same Shape or Figure with the whole Muscle, whence it is taken; and the whole Muscle of voluntary Motion is no more than a Fascicle or Bundle of such small Muscular Fibres: Therefore its Action can be nothing else, than the joint Action of all these. *Introd. to Diff. Page 1, 2.*

12. But the Action of the whole Muscle by Dr Glisson's Experiment, appears to be only an alternate Diastole and Systole: And therefore, by what has been said in the last Paragraph, there must be such a Diastole and Systole alternately in each of these small carnosus Fibres of which it is composed. *Diff. Exp. 1. Cap. XI.*

13. And by Exp. V. already mentioned on a Frog, it appears, that a very strong Muscular Motion may be easily excited by a very slight Impulse through the Nerves.

14. But such an easy Production of Motion is not conceivable, without the nicest Equilibration of all Parts of the Machine moved.

15. Therefore a Statical Equilibration of the Antagonist Muscles of each Limb is described, and delineated in *Diff. Tab. 4.* shewing the Equilibration of their Elasticity.

16. And a Hydrostatical Equilibration of the Fluid of the Nerves is described and figured in *Diff. Tab. 5.*

17. Now Equilibrated Bodies may be easily moved, by adding or diminishing the least imaginable Force of either Side; but if what is taken from one be added to the other, the Momentum of the Motion will be doubled, without the Loss or Expence of what is taken away, *Diff. Theor. 19, 20.* which is the Case in Muscular Motion, in its Progress from utmost Extension to final Contraction; as will appear in the Sequel.

18. We are now to shew how easily a very strong Motion may be excited, and carried on in a Machine of this Fabrick, whose Parts are in so just and accurate an Equilibration.

19. Previous to which it may be necessary to remove the following Objection or Difficulty, which occurs in *Diff. Cap. 10.* where it appears,

that the Power of absolute Elasticity in the Muscles greatly exceeds the utmost Force of Impulse in the Power of the Mind. But the Statical Equilibration of that Elasticity, and the Hydrostatical Equilibration of the nervous Fluid mentioned before, take off all Resistances, that would else be in the Way of that Impulse, by which it becomes sufficient for the Purpose, so as to be able to begin Muscular Motion; which is carried on in the following Manner.

20. The whole Progress of Muscular Motion is from the State of utmost Extension, through the States of Relaxation, Equilibrium, complete Inflation or Diastole, to the State of ultimate Contraction or Systole. In all which Courses from the first Term to the last each vesicular Fibre shortens it's Axis; and therefore draws the Limb affixed into Flexion, or Extension, at the Pleasure of the Mind. *Diff. Tab. 4.*

21. The Mind can act upon the Muscular Fibres in any State, but that of ultimate Contraction, which is the Termination of the Progress of Muscular Motion; as the beginning of it is from the State of utmost Extension. *Diff. Cap. 10.*

22. In the State of utmost Extension then, the longitudinal capillary Blood-Vessels on the Surface of each Vesicle in the Fibres must be extended, and therefore their transverse Diameters must be lessened: That is, these Vessels thereby become straiter, and the Circulation in them therefore more difficult; and in this State also the transverse Blood-Vessels of each Vesicle will be forced into serpentine Flexures, which must render the Passage of the Blood through them still more difficult. *Diff. Cap. 9.*

23. In this, and all other States of the Antagonist Muscles, both the Statical and Hydrostatical Equilibration, mentioned above, take place to such a Degree, as to remove all Resistances, that would else be in the Way of any supervening Impulse. *Diff. Cap. 10.*

24. Therefore if the Mind impels but a very little more of the nervous Fluid than usual, through the slender Tubes of the Nerves, into these extended Vesicles, they will be uniformly dilated as in the known Experiment of the Water-bellows. *Diff. Cap. 9. and Tb. 22.*

25. By this Distension of the Vesicles their Axes being shortened, and their Diameters lengthened, the longitudinal capillary Vessels on their Surface must be shortened, and thereby their Diameters enlarged; and the serpentine Flexures of the transverse Vessels will be extended; which in both Kinds will lessen the Resistance they gave to the transit of the Blood, which both by the Diastole and Systole of the Arteries is continually urged on to it's Passage through them; and being thus facilitated, every globule of Blood in it's Progress, by endeavouring to fly off by the Tangents of these Vessels and Vesicles, tends to expand them more, and thereby opens the Way for the further and easier influx of the nervous Fluid; to which the Blood-Vessels contribute as so many elastic Levers acted upon by the Blood in it's Progress. Thus by the assistance of these three Powers, of the nervous Fluid, the Blood,
and

and Blood-Vessels, the Progress from Extension to Inflation or Diastole of the Vesicles is made, with such a Degree of Celerity as the Will commands. *Diff. Cap. 9.*

26. The Muscle is at that Time tumid and enlarged by the Afflux of the nervous Fluid and Blood, which increases it's Bulk.

27. The Mind may keep up this Inflation, as long as it pleases, only by impelling constantly such a small Quantity of the nervous Fluid into the distended Vesicles, as is sufficient to supply the usual Expence of them in their common Course.

28. But if the Mind desists to send in this Recruit, or suspends it, then these Circular or arched elastic Vessels now turgid with elastic Blood, whose Areas have been thus forcibly enlarged, endeavour to contract themselves every way towards the Centres of their Areas, which are the Centres of the Vesicles; and, the Mind giving no resistance, this *Nisus* takes place to the complete Contraction of each Fibre; by which the Limb affixed is brought into complete Flexion or Extension, according as this or the other Antagonist has been acted upon. *Diff. Cap. 9.*

29. In this State the whole Muscle becomes shorter, and less in all it's Dimensions; harder and paler by Expulsion of a great part of it's Fluids through the Veins towards the Heart, and through the Extremities of the Nerves into the Tendon and *Periosteum*. And such are the visible *Phænomena* of this and all other moving Parts of the Animal Machine.

30. It may be imagined, that such Interruptions of the Course of the Blood in the Capillaries of the Arteries and Veins, and such uncertain subsultory Changes in the Figure of the Parts as have been described, might interrupt the regular Circulation of the Blood, and thereby disturb the Motion of the Heart; which is not observed to happen by moderate Exercise. But this Difficulty is removed by considering, that the whole is carried on in extensile and distensile Blood-Vessels, communicating one with another, and therefore what cannot Fig. 140. be received into one is immediately communicated to, and easily received by the other, and by it forwarded in it's return to the Heart, in the same Time and Quantity, as if the Passages through all the Vessels were equally open, and passable. Therefore though an Acceleration does arise in all Exercises, yet an Irregularity of the Circulation in a healthy Person is not observed to happen by any Degree of Exercise.

What I have here briefly recited, I have at large endeavoured to explain in a *Dissertation* on this Subject lately published, with several Figures annexed for Illustration of the Whole; by which, I hope, the Principles, Causes, Instruments, manner of Action, and Effects, in which the *Ratio* of Muscular Motion consists, have been pointed out from Anatomy, Mechanics, Hydrostatics, Observations, and Experiments.

periments. To which, for the sake of Brevity, I have every-where referred.

The Proof and Illustration of this general Scheme will appear in the Application of it, for explaining the various Functions of the Animal Œconomy; which may naturally become the Subjects of some future Inquiries towards answering the Intention of the worthy Founder* of these Lectures.

Explanation of
the Figures.
Fig. 137.

Fig. 137. Contains a Nerve, Artery, and Vein, of a human Subject, which before Excision were all of equal Length with a piece of Twine applied to measure them. *A.* The Nerve after Excision, continuing of the same Length as it was in the Body; to wit, equal to the Twine *B.* *B.* The Twine or common Measure of all the Vessels before Excision. *C.* The Artery, which in the Body was of the same Length with the Nerve and Twine; but being cut out and left to itself shrinks, or contracts, to the Loss of $\frac{2}{3}$ of it's Length; as those of Dogs lose about $\frac{1}{2}$. *D.* The Vein, which was equal to the Nerve and Twine in the Body; but being cut out and left to itself shrinks, or contracts as much as the Artery, though not with the same Degree of Force. Hence it appears that the Arteries and Veins are evidently elastic, and that the Nerves have not the least apparent Elasticity. See *Exp. I. Lect. I.*

Fig. 138.

Fig. 138. *A.* The *Rose of Jericho*, expanded by being steeped two Hours in Water, weighing 13 Drachms, and resembling it's State of Growth in the Ground.

Fig. 139.

Fig. 139. The same dry and contracted, weighing 7 Drachms and a few Grains.

Fig. 140.

Fig. 140. Contains the antagonist Muscles of a human Arm, placed at a little more than their natural Distance, with the Nerves, Arteries, and Veins, distributed to them in their natural Situation and Order. *A. A. A.* The Muscle *Biceps*, one of the Flexors or Benders of the Cubit or Fore-Arm. *B. B. B.* The internal brachial Muscle, another Flexor or Bender of the Fore-Arm. *C. C. C. C.* The external brachial Muscle called *Triceps*, an Extensor of the Fore-Arm. The Muscle called *Anconæus*, another Extensor of the Fore-Arm, is hid here. *D.* The common Trunk of the brachial Artery, distributing the Blood by it's Branches to all these antagonist Muscles on each Side of the Arm; red, expressed by the Lines thus ||| as in Heraldry. *E.* The common Trunk of the Vein, through which the Blood brought back from the Muscles on each Side returns towards the Heart; blue, expressed as in Heraldry thus ≡. *F.* The Trunk of the Nerve peculiar to the Flexors of the Fore-Arm, whose Branches are peculiarly distributed to these Flexors only, but not to the Extensors; white. *G. G.* Two Trunks of the Nerves peculiar to the Extensor Muscles of the Fore-Arm, whose Branches are peculiarly distributed to these

Muscles only, but not to their Antagonists the Flexors; white. The number of the Branches of these several Vessels, and the manner of their Distribution and Insertion into these Muscles, appear in the Figure. I need only to observe, that the antagonist Muscles, that is, the Muscles of each Side communicate one with another by their Blood-Vessels, but not by their Nerves.

By the help of this Figure the mechanical manner of Muscular Motion deliver'd in Lecture III, will be easily understood.

Fig. 141. *A.* Represents a Muscular Fascicle, or small part of a Muscle, macerated in Water, and carefully separated longitudinally from the rest of the Muscle, with it's tendinous Extremities; expressing together the Figure of the entire Muscle, as mentioned §. 11. Lect. III. and at greater Length in *Cap. VII. §. 5. Diff. de Struct. & Mot. Musc. and Introd. §. 2. and 18. B, B, B. &c.* The carnous red Fibres drawn asunder, that the nervous white *Fibrillæ* or Filaments distributed to them may better appear. *C. C. C.* The nervous white Filaments, entering into the carnous Fibres at Angles more or less acute. *D. D.* The tendinous Extremities of the Muscular Fascicle; being the Nerves and nervous Membranes of each Muscle or part of a Muscle collected, and compacted to the Firmness of a Tendon; whence being again expanded, it is justly called the *Aponeurosis*; and being farther continued over and into Bones, is called the *Periosteum*. *F. H. G.* Shew the Directions and Distributions of these Processes of the Nerve, Artery, and Vein, to the Muscular Fascicle, similar to their Directions and Distributions to the whole Muscle. This Figure is the same with the next following; excepting that in this the small nervous Vesicles in each carnous Fibre are supposed to be covered by the Blood-Vessels.

Fig. 142. *A.* Shews the angle of Insertion of the Nerve into this Fascicle, as into the whole Muscle, with the Direction and Distribution of it's Branches into the Muscular Vesicles. *B. B. B.* The Chains of the Muscular Vesicles, supposed to lie in the Direction of the Axis of each carnous Fibre, and to be inflated or distended by the Influx of the nervous Fluid, at the command of the Will in the Diastole of the Muscle. See *Diff. de Struct. & Motu. Musc. Cap. VIII. §. 2, 4, 5, 7, 8. and Abstr. in Lect. III.*

This verficular Structure of the smallest Muscular Fibre, pointed out and confirmed by a similar Structure in all the visible moving Parts of the animal Œconomy, may be justly inferred from the plain Analogy of Nature, which is always similar to itself; by which it will be easy to understand what is said of the general Muscular Structure in *Diff. Cap. VIII.* and of the Manner of Muscular Motion *Cap. IX.* and more compendiously in the *Abstract* of that general Scheme in *Lect. III.*

Fig. 143. *A.* A live Frog, the Head being cut off, hanging by the Fore-Legs without Motion.

Fig. 144.

Fig. 144. B. The same Frog, whose inferior Limbs, which hung loose and free, are brought into a strong and complete Contraction by a very slight Impulse with the button end of a Probe, on the upper Extremity of the spinal Marrow; the end of the Probe being filed flat and smooth for that Purpose. See *Exp. V.*

C H A P. VIII.

MONSTERS.

Some Reflections on Generation, and on Monsters; with a Description of some particular Monsters: By Daniel de Superville, Priory-Counsellor and chief Physician to the Margrave of Brandenburg-Bareith. Translated from the French by Phil. Hen. Zollman, F. R. S. No. 456. p. 294. Jan. &c. 1740.

I. IT cannot be denied, that since the middle of last Century to this Time, very important Discoveries have been made in Natural History: However, those Discoveries are very insignificant, in comparison to what is still concealed from us. We have some Knowledge of the coarser Sort of Nature's Operations, but the Niceties, the Particulars of them, escape us. If we endeavour to push our Knowledge so far, we find ourselves surrounded with Clouds, we grope in the dark, and it is very difficult, if not impossible, to catch Nature in the Fact. It even seems, we have had better Success in determining what Nature does not do, or cannot do, than in specifying what she actually does.

The Human Body is a Compound of Springs, which produce very regular Motions: Yet these Springs themselves we do not know but very superficially, and are far from knowing how those Motions are produced. We know, that we are born, that we exist; but how came we to this Existence? How were we produced? The Generation of Mankind and of the Animals is one of those *Phænomena*, where innumerable Experiments have not been of so great Use, as they are else in other *Phænomena* of Natural Philosophy, for discovering their most secret Springs.

It is still a Dispute, whether the Male or the Female contributes most towards Generation. It is certain, that for the Generation of Mankind there must be a Male and a Female, and it is the same thing with regard to that of Brutes. There is all the Reason in the World to believe, that what is written about Hermaphrodites, and about those Animals which, being endued with the Advantage of the two Sexes, produce alone their Like, has not been examined with all the necessary Attention and Exactness.

The *Semen* of Man, which is certainly a most necessary Agent for Generation, because it has been observed, that those who have none, or do not eject it according to certain requisite Conditions, are not fit for multiplying their own Species: This *Semen*, I say, is a Liquid full of small Worms. It would be absurd to deny it: All exact Observators



Fig. 134.



A Scale of Inches for Fig 133 & 134.



Fig. 136.

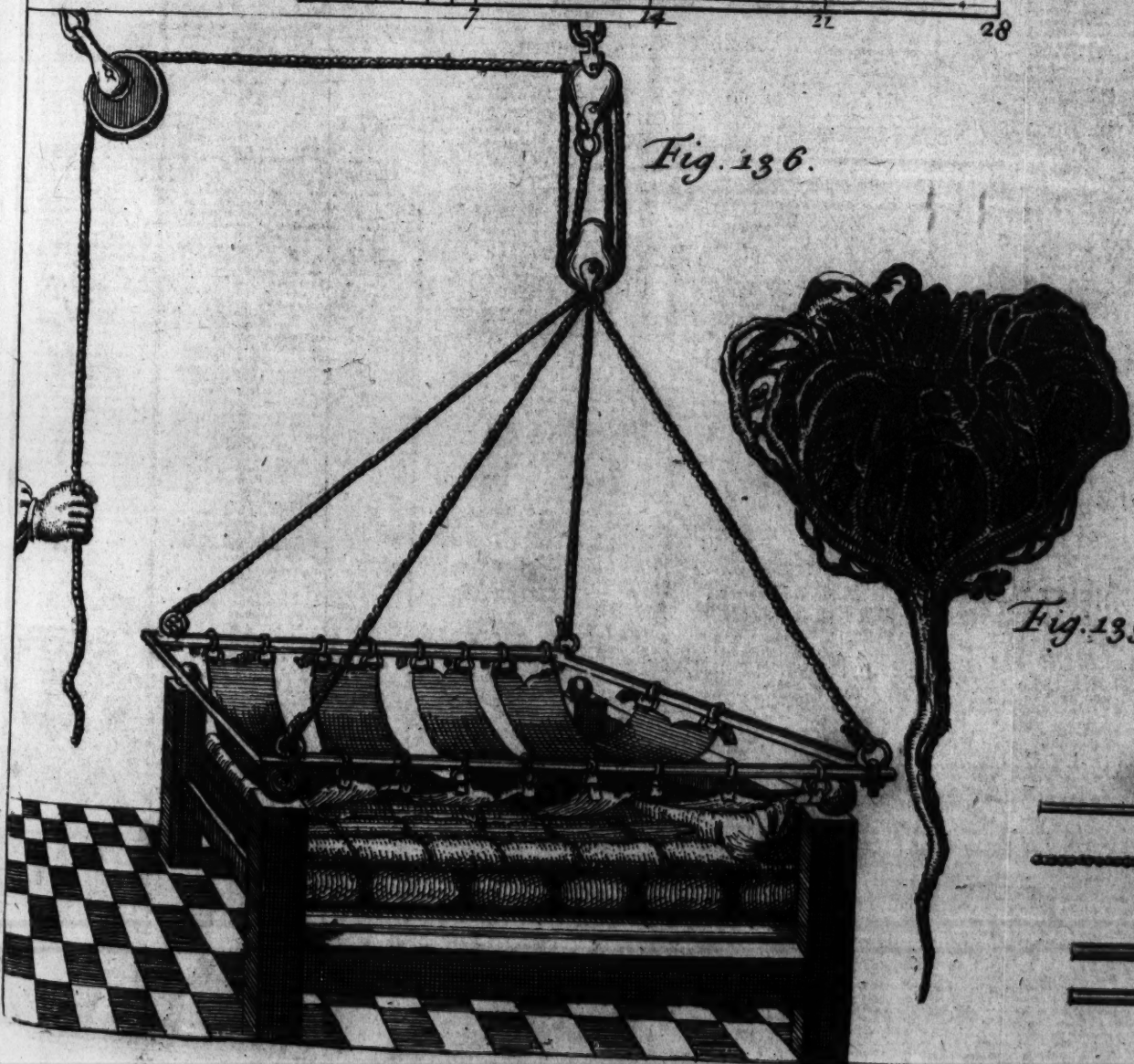


Fig. 135.

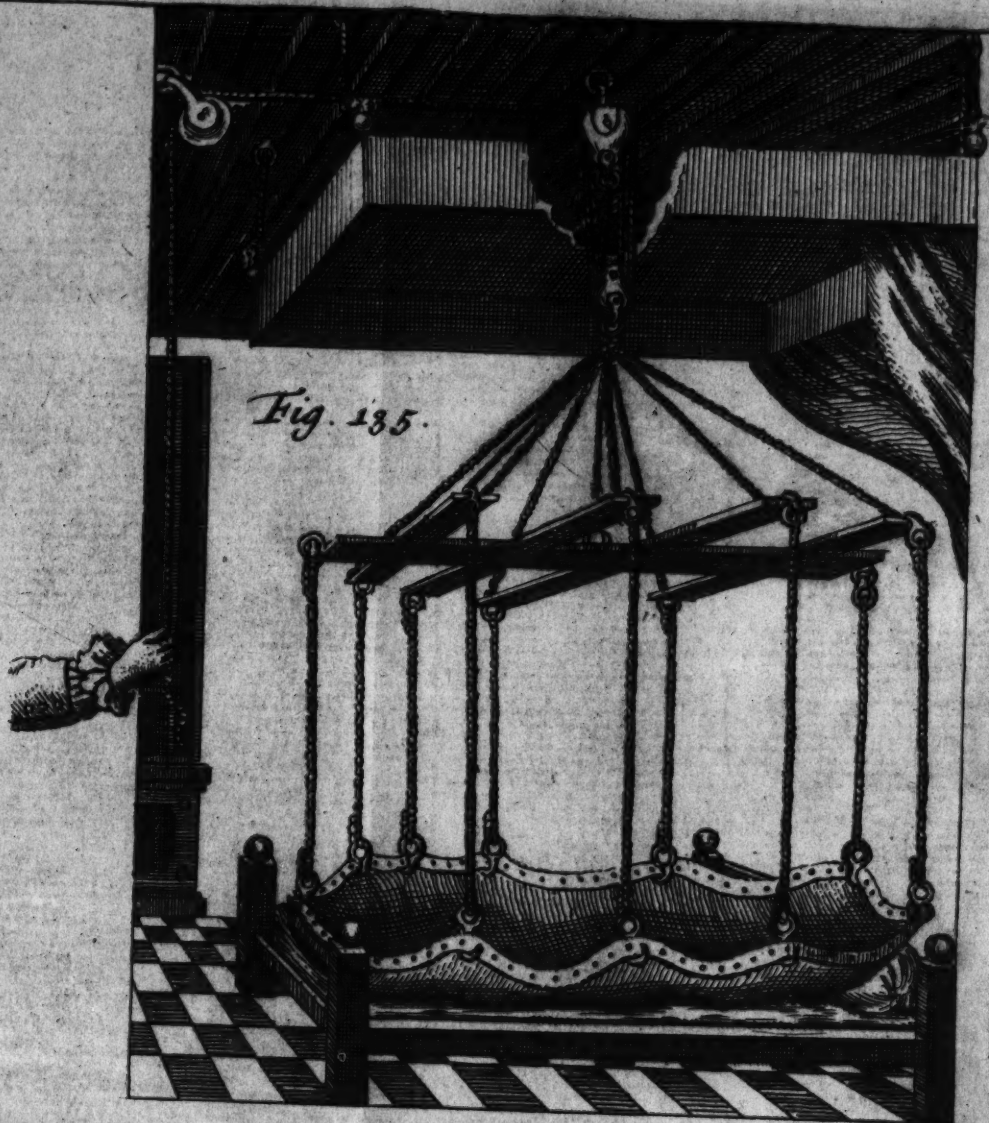


Fig. 139.

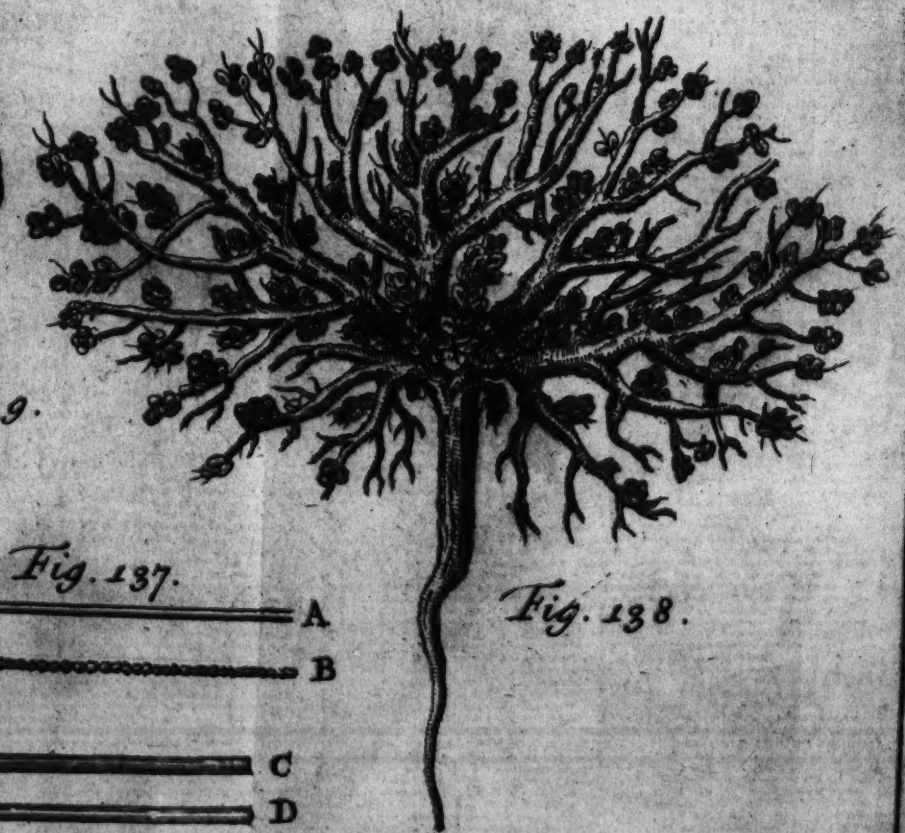


Fig. 137.

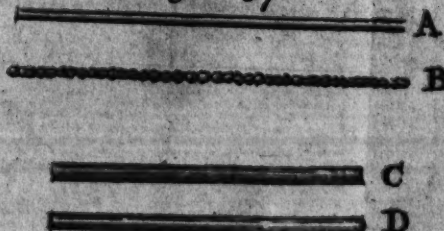


Fig. 138.

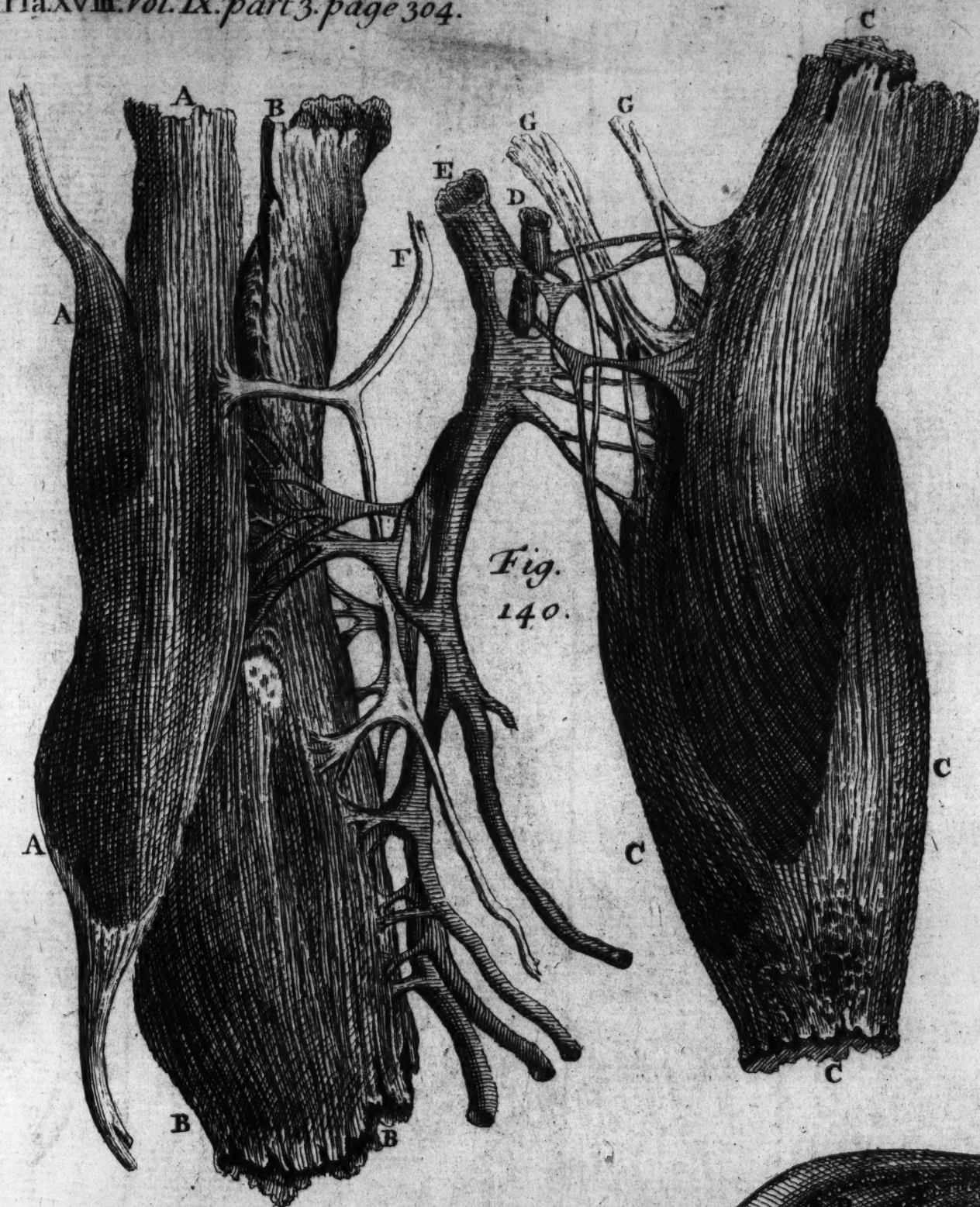


Fig. 140.

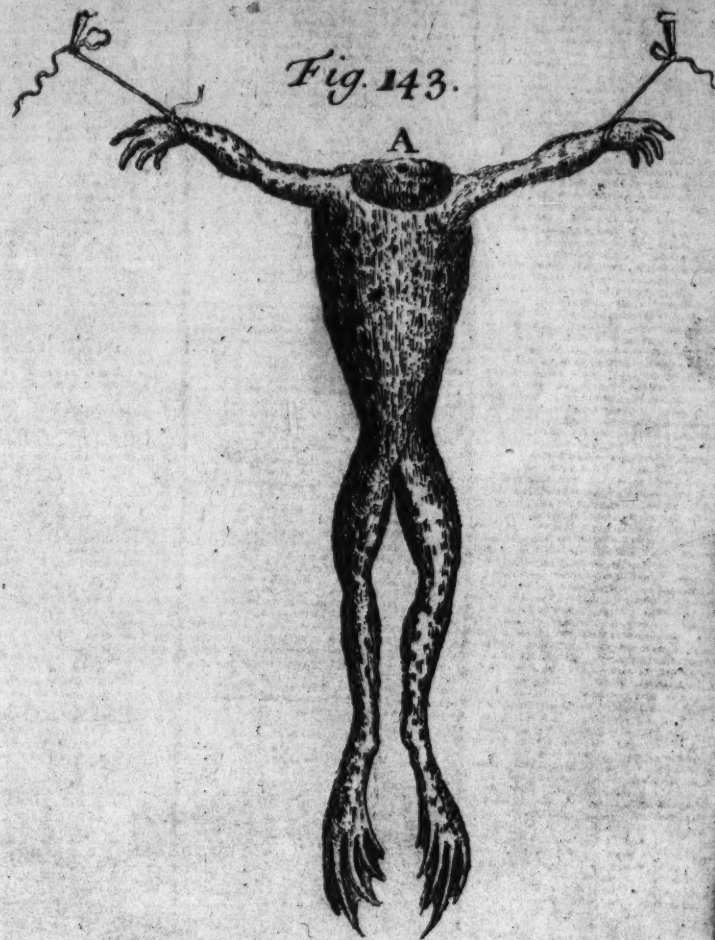


Fig. 143.

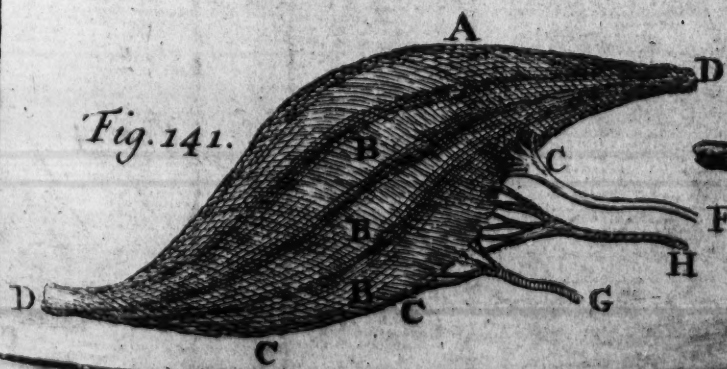


Fig. 141.

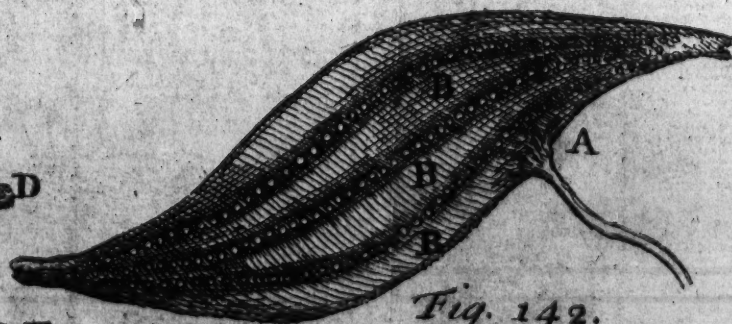


Fig. 142.

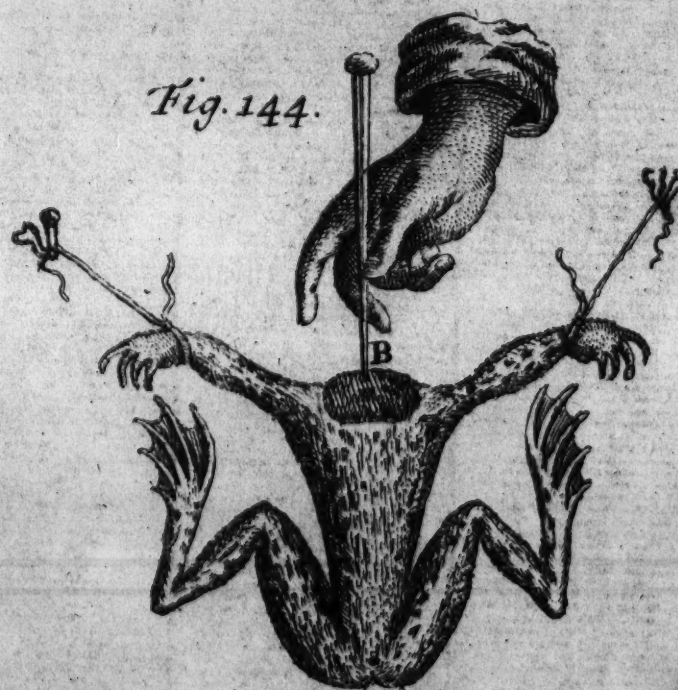


Fig. 144.

Observers have taken Notice of them, and offered to shew them to the incredulous. I have observed these *Animalcula* in human *Semen*, in that of several Quadrupedes, and in that of some Birds. I have observed, that the Figure of these *Animalcula*, as to Birds, was different from that of other Animals, I have preserved *Animalcula* in a proportionable Warmth alive for several Hours; I have observed their Strength and Liveliness to lessen by Degrees, and at last entirely to cease; and I have observed them dead, not swimming any longer, but always sinking to the Bottom. I have observed in the *Semen* of Men, who had a virulent *Gonorrhœa* upon them, those *Animalcula* to be without Motion, and like dead. I might enlarge upon the Particulars of a greater Number of Observations; they all prove the real and constant Existence of *Animalcula* in the *Semen* of Males.

These Worms, according to some Natural Philosophers, are true *Embryoes*. As soon as an *Animalculum* has entered into an Egg, the Female who carries the Egg in her Body, has conceived; she harbours it, nourishes it, and contributes towards the shaping of it, until it becomes an Animal, too big to be any longer contained in so small a Place, and strong enough to bear the Air.

According to other Natural Philosophers, the Eggs that are in the *Ovaria* of the Females, contain the Image, the Type, the Picture of the *Embryo*; and the subtile Vapour of the Male *Semen*, or rather the occult Quality of that Seed, impregnating one of those Eggs, immediately fixes that Image, and makes a real *Embryo* of it.

These latter entirely deny the Existence of *Animalcula* in the Seed, because they have not seen them; and if they are shewn them, they maintain that they are foreign Beings; or, that they are a particular sort of Worms, which form a separate Class among those Insects: That God created them to exist in the seminal Liquid, that they keep in it as in their Element, that they multiply there, and that they continue there and die, such as we observe them by the Microscope.

I do not pretend to decide, that the former are entirely in the Right; they maintain an Hypothesis founded on some Probabilities. Alas! who can hope upon so dark and hidden a Subject to find a demonstrated System? The second Opinion seems to me unwarrantable: It is founded upon Words which have no Reality. How can one form to himself the Idea of a Vapour extremely subtile and active, that shall have the Faculty of giving Life and Motion to an Image, to a Type, in short, to a thing that was not real? The Pre-existence of the *Embryo* in the Egg can by no means be demonstrated: Even by the Help of the best Microscopes, there is never any thing found in those Eggs, but a clear and limpid Liquid.

I keep among my Curiosities six ossified Eggs, which I found in the *Ovaria* of a Woman who died at the Age of 60. They are not all of the same Bigness. I broke two of them, and examined their internal Structure with all the Attention imaginable; but found no-

thing there except osseous Fibres, issuing from the Centre towards the Superficies; there was not the least Appearance of an *Embryo*, nor of it's Image.

One must have an Imagination extremely prepossessed to persuade one's self, that there is an organized Body in the Liquid contained in those Eggs: Or, it requires a very particular Natural Philosophy, to pretend to demonstrate, that a bare Vapour (more subtile than any the most spirituous Vapours we know of) could, by it's simple Touch or Friction, produce an organized Body, where there was none.

The Generation of Mankind, as well as of Brutes, by the means of the *Animalcula*, which are observed in the *Semen* of Males, seems more analogous to all that we see Nature do for the Production and Multiplication of the Vegetables. There needs no Imagination for forming to one's self an Idea of it. Each *Animalculum* is an *Embryo*, is a small Animal of the same Species with that which harbours it: As soon as it finds itself disengaged from the Confinement in which it was, and in a Place where it meets with a Humour proper for it's Vegetation and Expansion, it takes Root there, it swells like a Corn newly put into the Earth, it spreads itself, it's Members shape themselves, and by degrees take more Strength and Consistence, it's Parts grow longer, and disentangle themselves, as it were, from all those Plaits and Folds in which they were confined before, and the *Embryo* becomes a *Fœtus*.

I own, that the immense Number of *Animalcula*, which are observed in the seminal Liquid of Man, seems to oblige one to reject this Hypothesis, and particularly this Opinion, that every *Animalculum* is an *Embryo*. For it is certain, that in every Man there would be enough of them to people a vast Country, and of all that immense Quantity there are but a few that come to any thing. And so, there you have Millions of little Men, created never to exist; which seems directly contrary to the wise Intentions of the Creator, who, in all Likelihood, made nothing in vain. But *Teleology* is one of those Parts of Philosophy, in which there has been but little Progress made, wherein one reasons only by Conjecture, nor can demonstrate any thing otherwise than *à posteriori*. Who dares presume so far as to pretend to penetrate into all the Designs of the Almighty, and into the divers Ends he has proposed to Himself in the Creation of the Universe? Besides, it is certain, that half of Mankind perish, before they come to the Age of one Year, that is to say, before they can know themselves, before they can answer the Ends God proposed to Himself when He created them. Would one say therefore, that their Existence was useless? But moreover, this seemingly useless Quantity of *Animalcula* equally affords an Argument against the Hypothesis of those, who believe the *Embryo* is in the Egg. One cannot maintain, that all the Eggs in the *Ovaria* are fruitful. And so there we have equally an immense Quantity of Types of *Embryo's* created
for

for nothing, and absolutely useless; and it will follow from both Hypotheses, that God might have saved Himself the Trouble of creating so prodigious a Quantity of Creatures in order to precipitate them into nothing. But who dares say, that the creating so many Millions of Creatures more has cost Him any more Pains? And by what could one prove, that all those *Animalcula*, which do not come to the State of a *Fœtus*, are annihilated?

The Hypothesis of the Generation by *Animalcula* in the seminal Liquid of Man, appears supported and confirmed by several Experiments. *Leeuwenhoek* has already observed, that a wild Male Rabbet, and a tame and white Female, produce young ones entirely resembling the Father; and that it is a Cheat very common in *Holland* to sell that sort of Rabbets, for wild ones, and that it is only by the Taste one can find out the Truth. There is among domestic Animals a sort of Poultry without Tails, and another sort with the Feathers turned upwards; if a Cock without a Tail is put among ordinary Hens, or a Cock with the Feathers upwards, all the Chicks will prove like the Cock *. The same Experiment may be made with Pigeons, with Canary-Birds, &c. — A Mule sprung from an Ass and a Mare, resembles more the Ass than the Mare, whereas a Mule coming from a Horse and a She-Ass, has more of the Horse's Nature. All this proves in some measure, that the Male furnishes the most essential Part in the Generation, viz. the *Embryo*.

By the same Hypothesis some *Phænomena* observed in Generation, may be more easily accounted for, *Hippocrates* believed that the Difference of the Sexes depended on certain Dispositions in the Seeds of the Male and the Female; that when the Male was the most vigorous in the Copulation, they begot Males; but if the Seed of the Female prevailed, they produced only Females. This Opinion, absurd as it is, has been followed and maintained by several celebrated Physicians. How can one believe, that a little more of I do not know what, (for they do not determine wherein the more or less of the Virtue in the Seed must consist) a little more Activity, a little more Spirituousness, should compose, should determine any Organization? It is more natural to believe, that every *Animalculum* has already the Sex it is to have when it comes into the World. It has been disputed Tooth and Nail, to determine the Time when the *Fœtus* becomes animated, and to know from whence and how it's Soul enters into it's Body. According to the most general Opinion, there must be at every Conception a new Creation of a Soul: Or, according to others,

R r 2

there

* This Observation is not true: I have kept these Cocks without Tails among other Poultry, with some Hens also of the same Kind; and yet the Chicks were so far from being all like the Cock, that, though I was solicitous to preserve the Breed, yet I could seldom breed any without Tails. I had one Hen, with the Feathers upwards; and though I had no Cock of the same Sort; yet I had more Chicks like this one Hen, than like any Cock in my Yard. J. M.

there is always a Legion of created Souls fluttering about in the Air and watching the Minute for entering into a fruitful Egg as soon as it is impregnated. What an Extravagance is this! Would it be as absurd to believe, that every *Animalculum* has already it's Soul, which waits only for the little Machines unfolding itself in order to exert it's Function?

According the Hypothesis of *Animalcula*, one may easily account for those monstrous Births, when two *Fætuses* are joined together, or Children and Animals are double, in the Whole or in Part. I keep in my Collection a Pig, that has 8 Feet; the two Bodies, that are separated, reunite themselves by the *Spina Dorsi* below the *Diaphragma*, and have but one visible Neck supporting a Head, bigger than it should be, on which there appear 4 Ears, 3 Eyes, and the Snout seems double. I have also the Head of a Foal, which is double, and has 3 Eyes. I have a *Turkish* Duck, which is double, the 2 Bodies are joined by the Breast; each Body has 2 Wings, and 2 Legs; but they have only one Neck with one Head. I keep a Chicken, which has a second Rump fixed to it's Breast, with the 2 Legs, and 2 Paws. I even have a Frog, which besides it's 4 Paws, has a Fifth as well formed as the others, which comes out at the Right Shoulder. The Production of all these Monsters that are double, or have superfluous Members, may very well be occasioned by two *Animalcula* entering into the same Egg; they touch, they close, they unite, they crowd each other: The Parts of the weakest, being too much crowded, cannot extend nor display themselves; so they vanish, as it were, so much the easier as they are extremely tender, and without any sensible Consistency.

It is not more difficult to find plausible Reasons for imperfect Monsters, or that have an odd Conformity, as to the Whole, or as to some of the Members. I have the *Fætus* of a Sheep which has no Nose; the Part where the Nostrils should be, seems to be flayed, and the two Eyes are there one by the Side of the other. On the Forehead there is a small Trunk of about an Inch and a half long, and pierced at the End by two Nostrils. I have another, which has but one Eye in the Middle of the Forehead. I have a human *Fætus* of about 7 Months, which has no Mark of the Sex, and instead of the Legs there is a Bag that runs to a Point, the Extremity of which is cartilaginous: In that Bag there is a Bone 3 Inches long, covered with a muscular Flesh; it is articulated with the *Os Sacrum*; the *Ossa innominata* are wanting, and below the *Anus*, which is upon the Middle of the *Os Sacrum*, there is a small Tail like that of a Pig.

When I was at *Stetin* in *Pomerania*, about 12 or 14 Years ago, a Midwife came to tell me, that a Sergeant's Wife was delivered of 3 dead Children, one of which had no Head. I immediately went, and observed, that these *Fætuses* had died at different Times. One began already to corrupt, and the *Epidermis* severed itself at the least Touch.

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The Monster without a Head was also already quite flabby, and the third seemed to have died but a few Hours before. I examined the Monster; there was no Appearance of any Head, and instead of the Navel there was a small Lump of spongy Flesh of the Bigness of a large Strawberry. About the *Secundines* I found but 2 *Placentas*, and 2 Coats? so that this Monster must absolutely have been in one of those Coats with another *Fœtus*. The Midwife was not skilful enough to give me an Account of the Delivery: I put Questions to the Mother, who assured me she felt one Child dying 3 Weeks before, and that the last died the Evening before. I offered a good Sum of Money to have all she was delivered of, but they would not let me have it. I still offered Money to have only Permission to dissect the Monster, but the impertinent Superstition of the Parents deprived me of that Satisfaction.

I still preserve in my Collection a monstrous *Fœtus*, which deserves particular Attention. It is of 8 Months, without Head or Arms: The Figure outwardly seems to be nothing else but the *Abdomen* with the Legs; these are well-shaped and proportioned, with the Toes, and the Beginning of the Nails; the Right Foot however is, as it were, crooked, and bending inwards. Having opened it, I found indeed but one Cavity, which in the upper Part contains a small Bladder. There is not in all the Cavity any thing besides a Bit of Intestine, the two Kidnies, the Bladder, and the Right Testicle, which lay upon the Ring. The Flesh was hard, and, as it were, *carcinomatose*. The Navel-string went in a little higher than naturally, and a little towards the Right Side, entering into the Intestine. There is a slender Intestine of about 14 Lines in Length, proceeding from the same Place, where the Navel entered into the Cavity; next comes the *Cæcum* with it's vermicular Appendix, the *Colon* and the *Rectum*, the whole together of the Length of about two Feet. These Intestines go from above to below in *Zic-Zac*, and are attached to the *Spina Dorsi*. There is no Footstep of the Heart, the Lungs, the Stomach, the Liver, the Spleen, the Pancreas, the Mesentery; all that is wanting. The small Bladder I mentioned was fleshy, and contained some Serosity; it is attached to the first of the *Vertebras* of the Neck. This Beginning of the *Spina* is bent forwards like a Bow, and forms the Monster's Roundness from above. The bended Extremity kept the little Bladder, as it were, under, and shut up in the Cavity closed up by the Ribs. This Cavity was to form the *Thorax*, but the *Sternum* was wanting as well as the *Diaphragm*.

Des Cartes and *Lancisci* would in vain have looked out here for the Seat of the Soul, and the *Punctum Saliens* would prove very hard to be determined in this *Fœtus*. But I do not now intend to enlarge upon it. The Business is to find some plausible Reasons about the Origin of those sorts of Monsters I have now described.

Fig. 145.

The

The Opinions of most of the Natural Philosophers on this Head may, upon the Main, be reduced to these two Hypotheses: 1. That Monsters are original, that is to say, that even in Conception the Monster is conceived. 2. That they are not produced but by Accident. One may conclude from what I have said about double Monsters, that I believed them accidental; and I believe, rigorously speaking, they are so, whatever they be: For supposing every *Animalculum* to be an *Embryo* created, I cannot imagine them to be created imperfect. Their Imperfection, their Deformity, may proceed from a thousand Accidents, either in the *Reservoirs* where they are contained, or in the different Routs they are obliged to take going from Father to Son. In this Case it may easily happen, that they are Monsters, even in the Moment of Conception, though they be such by Accident. To how many Accidents are they not subject afterwards in the Venter of the Females? A Fall of the Mother, a strong Pressure, a Contusion, &c. may disorder the nice and tender Structure of that little Creature so far, that a great many of it's Parts do not unfold themselves any longer, are destroyed, or have their Order and natural Situation entirely changed.

The disturbed and disordered Imagination of the Females ought also to be ranged among the accidental Causes of Monsters. I have seen in a Sow just slaughtered 7 Pigs, which all had the bloody Mark of the Knife about their Necks. About some 20 Years ago, a Cloth-shearer in *Holland* had the Misfortune to fall into the Hands of some drunken young Fellows, who murdered him, and stabbed him with more than 20 Wounds with their Swords. He was to be married that very Week: His Sweat-heart saw his Corpse naked with all those Wounds, and was 2 Days after delivered of a dead Child, which had the Marks of the Wounds in the same Places of it's Body, where the Mother had observed them on her dead Lover.

I very well know, that these sorts of Instances, of which one might alledge some Hundreds, will not go down with certain People, who deny the Effect of the Mother's Imagination on the *Fœtus*. They lay Stress on two principal Reasons: 1st, It is pretended, that the *Fœtus* has no immediate Connexion with the Mother who carries it. But this is ridiculous; for one cannot deny, that the *Secundines* are closely united to the *Matrix*, and receive from the Mother a Humour, or a Liquid, which by the Navel-string it remits to the *Fœtus*. It is by that way it receives it's Nourishment, that is to say, the Matter necessary for it's Increase. Accordingly one may say, that the *Fœtus* owes part of it's Being to the Mother; and that the Liquid which runs in the Vessels of the Mother, runs likewise in the Vessels of the *Fœtus*. 2^{dly}, It is said, that it is incomprehensible how the Soul of the Mother can have an Effect on the Child. I own I do not comprehend it neither. It does not follow from thence, that we ought to reject as false all that our Reason cannot penetrate into. When once the Existence and the Nature of the Soul

Soul has been demonstrated, when once we have a perfect Knowledge of the Manner how an immaterial Being acts upon Matter, we shall then reason in Consequence about what the Soul can do, and cannot do. Daily Observations demonstrate to us, that the disordered and disturbed Imagination of Women often hurts the Infants. And this is a Reason which I add to all the others, to think I have good Grounds to conjecture, that all Monsters are accidental; and to believe, that by the Hypothesis of *Animalcula* one may better explain the *Phænomena* which are observed in Generation, than by any other Hypothesis known as yet.

II. Having obtained from the famous *Museum* of *Wittsen* at *Amsterdam*, a *Bregma* of a Gigantic Size, in Height 9 *English* Inches, and in Breadth 7, with a Description, and Figure by *Ruysch*, representing the Height of the Head from the Chin to the Crown 20 Inches, and the Breadth at the Temples 12 Inches, and also another Bone of the same Sort, in 1728, the Height of which was $5\frac{5}{8}$ Inches, and the Breadth 5 Inches, but without any Figure or Reference to the Head, I could easily find, by taking 8 Lengths of the Head, according to the Rules of Painting, that the Stature of the Giant was 13 Feet 4 Inches. But being desirous also to know the just Proportion of the other *Bregma*, according to Mathematical Rules. I proposed the following Problem to Dr *Henry Kühn*, Professor of Mathematics at *Dantzick*.

A Bregma of a Gigantic Magnitude, by Ja. Theod. Klein, Secr. to the Republic of Dantzick, F. R. S. No. 456. p. 308. Jan. 1740. Fig. 146. 147.

If in two human Bodies of different Stature, the Height of the *Bregma* in the former, shall be 9 Inches, the Breadth 7, the Height of the whole Head 20, the Breadth 12; and in the latter, the Height of the *Bregma* $5\frac{5}{8}$ or $\frac{46}{8}$, the Breadth 5, and the Height and Breadth of the whole Head unknown: To determine the unknown, and to settle the Proportion of the Stature of the former to that of the latter.

This may be resolved 3 ways,

If the Bodies were similar, the Question may easily be answered by inferring, that, as in the former Body the Height of the *Bregma* is to the Height of the whole Head, or even of the whole Body (which is it's Octuple) so in the latter Body the Height or Breadth of the *Bregma*, to the Height of the whole Head, or even of the whole Body; but because 9 to 7, and $\frac{46}{8}$ to 5 are dissimilar Proportions, those Bodies are not similar. Therefore we must consider both the Heights and Breadths of the Bones in question, as will appear from the 3 following Methods.

$$(a) \quad 9'' : 20'' = \frac{46''}{8} : \left\{ \begin{array}{l} \text{the Height of the Head desired.} \\ \frac{20 \cdot 46''}{9 \cdot 8} \end{array} \right.$$

The first Method.

$$\text{The Octuple of this will be} = \frac{8 \cdot 20 \cdot 46''}{9 \cdot 8} = \frac{20 \cdot 46''}{9} = \frac{920''}{9}$$

$$= 102$$

$$= 102 \frac{2}{3} \left\{ \begin{array}{l} = 8 \text{ Feet } 6 \frac{2}{3} \text{ Inches} \\ = \text{the Stature of the second Body.} \end{array} \right.$$

$$(3) \quad 7'' : 20'' = 5'' : \left\{ \begin{array}{l} \text{the Height of the Head desired} \\ \frac{100''}{7} \end{array} \right.$$

$$\text{The Octuple of this will be } = \frac{800}{7} = 114 \frac{2}{7} = 9 \text{ Feet } 6 \frac{2}{7} \text{ Inches} \\ = \text{the Stature of the second Body.}$$

(2) The Addition of the Statures found, and the Bisection of the Sum

$$\text{to obtain the Arithmetical Mean, will be } \frac{8', 6'' \frac{2}{3} + 9', 6'' \frac{2}{7}}{2}$$

$$= \frac{17', 12'' \frac{1}{2}}{2} \text{ nearly } = \frac{18' + \frac{1}{2}''}{2} \left\{ \begin{array}{l} = 9 \text{ Feet } \frac{1}{4} \text{ Inch} \\ = \text{the Structure of the second} \\ \text{Body very nearly.} \end{array} \right.$$

The second Method.

$$9'' + 7'' : \frac{46''}{8} + 5'' = 20'' : \text{The Height of the latter Head.}$$

$$\text{That is, } 16 : \frac{46 + 40}{8} = 20'' :$$

$$\text{That is, } 16 : \frac{86}{8} = 20'' : \left\{ \begin{array}{l} \text{Height of the latter Head } \frac{20 \cdot 86''}{16 \cdot 8} \\ = \frac{5 \cdot 86''}{4 \cdot 8} = \frac{430''}{32} = \frac{215''}{16} \end{array} \right.$$

$$\text{The Octuple of this will be } = \frac{8 \cdot 215''}{16} = \frac{215''}{2} = 107'' \frac{1}{2}$$

$$\left\{ \begin{array}{l} = 8 \text{ Feet } 11 \frac{1}{2} \text{ Inches} \\ = \text{the Stature of the second Body nearly.} \end{array} \right.$$

This does not differ from the former Calculation more than $\frac{1}{4}$ of an Inch.

The third Method.

Since in the same Parts of different Bodies (for Example, in 2 *Offa Bregmatis*) the Surfaces of the Parts are to one another, as the Squares of the Heights of the whole Bodies; and those Surfaces are also to one another, as the Products of the Heights of the Parts into the Breadths; those Products also will be to one another as the Squares of the whole Bodies. Wherefore, since the Height of the former Body is 20'', and so it's Octuple, or Height of the whole Body is 160'', the Square of which is 25600, say

The

The Height of the former <i>Bregma</i> into it's Breadth.	The Height of the latter <i>Bregma</i> into it's Breadth.	The Square of the Height of the whole former Body.	The Square of the Height of the whole latter Body.
9 • 7 : $\frac{46}{8}$	• 5	= 25600''	:

That is, $63 : \frac{230}{8} = 25600'' : \frac{230 \cdot 25600}{63 \cdot 8} = \frac{230 \cdot 3200''}{63}$

Since therefore $\frac{230 \cdot 3200''}{63} = \frac{736000''}{63} = 11682'' \frac{1}{2}$ very nearly ;

= the Square of the Stature of the second Body ; the Stature of the second Body (extracting the Square Root of 11682) will be very nearly = 108 = 9 Feet, *English* Measure. This Stature, being a mean between those found already, may be accounted the most accurate.

Lastly, as 8 Heights of the Head may very well be assumed for the Height of the whole human Body, and as the Height of the former Gigantick Head is 20 Inches, the Stature of the former Giant will be equal $8 \cdot 20'' = 160'' = 13$ Feet 4 Inches. Consequently the Stature of the former Giant is to the Stature of the latter, as 13 Feet 4 Inches to 9 Feet, *English* Measure, or as 160'' to 108'', or as 40 to 27.

III. *Elizabeth Spencer*, being tried at our Assizes for the City and County of *Norwich*, for Shop-lifting, and being found guilty of the Crime, received Sentence for Transportation ; for respiting of which Sentence she pleaded her Belly, which Plea, as she was a married Woman, appearing what was very probable, she was favoured by the Mayor and the other Magistrates, by being allowed the full Time that she said she had to go ; at the Expiration of which she was delivered of a Child, which I saw a few Hours after it was born. The Head had a Rising on the Top of it, and the Nose was as if one Nose was on the Top of another, but only two Nostrils, and those at the Bottom of the lower Nose. The Arms were without the Elbow-Joint ; the two Bones, which make the lower Joint of the Arm, in common, were in this extended to the Shoulder. Just under the Ribs, and above the Hips, was a deep Place, as if a Cord had been tied very straight, so as to sink down below the Reach of the Eye : This girding-in of the Body, I believe might go almost round : I did not turn it, to see whether it did or not, but it was continued as far about the Body as I could see, without turning it. By this girding-in of the Body, the lower Part of it was almost round, it being without either Legs or Thighs ; but had two Feet joined unto the lower Part of the Body, the Heels inward, the Toes (of which it had not the full Number) pointing towards the Sides. As to Sex, this Creature was a Female,

Concerning a Monstrous Child born of a Woman under Sentence of Transportation ; by Mr Timothy Shel-drake, *ibid* p. 341, dated Jan. 8. 1734-5. Fig. 148.

male, and born alive, it was the Opinion of the Women about her, that the Midwife had injured the Head in the Birth, by which the Rising in the Head was produced; and this surprising Creature that was born alive, was thereby soon deprived thereof. This Woman, who had been the Mother of several Children, before this strange Production, and all in perfect Form, was by some free speaking Persons charged with having been guilty of some Practices both unnatural and unlawful, which she very positively always denied; and said that she knew nothing that could give any Change to the natural Form of this Creature, but the strange Apprehensions that her Sentence had put her under, from the uncommon Creatures the Country to which she was sentenced might bring in her Sight. These odd Ideas that she had formed to herself, were all and the only Thing, that had occasioned so great a Change from the natural Form the Child might otherwise have had, as she often asserted.

An Account of a monstrous Boy; by Andrew Cantwell, M. D. Montpel; translated from the French, by T. S. M. D. Dated at Montpelier, Dec. 27. 1731. N. S. No. 453. p. 137. Apr. 1739.

IV. There is actually in this Town, a Lad of 13 Years of Age, born at *Cremona*, who bears the lower Parts of another Boy, which seem to issue from his Epigastric Region, between the *Cartilago ensiformis* and the Navel. The Fore-part of the one faces that of the other. The Head and Trunk seem buried in the Lad's *Abdomen*, down to the Hips, where the Connection is plainly to be seen. This Portion of the prominent Body has a well-formed *Anus* and *Penis*. The *Scrotum* has a fine Down on it, but is void of Testicles, and seems to be filled with the Intestines. Nothing passes through these two Outlets. I have perfectly well distinguished the two *Ossa Ilium* in their natural State, but could not feel the *Os Sacrum*. The Articulation of the *Femur* is somewhat discernible on each Side: And I have perceived the Pulsation of the anterior crural Arteries. The Lad is very sensible when these additional Feet, Legs, or Buttocks, are pinched, or overmuch pressed. He has lately had the Small-pox, and these have suffered by it equally with him. At his Navel I found a considerable Rupture, which is covered by this Portion of a Body. This Rupture grows monstrously big in wet Weather, and diminishes again in dry. It has a circular Hole in it, which runs through the *Peritoneum*. The Lad is of a thin Habit of Body, but otherwise enjoys good Health. His Father, *Michael Martinetti*, a Tinker, told me, that this is the 7 Child his Wife *Nunciada* bore him. She was 30 Years of Age at his Birth, and bore him 2 more since. All the rest were of the natural Shape.

An Account of a monstrous Foetus, resembling a hooded Monkey: Communicated by Mr William Gregory of Rochester. No.

V. A Woman, aged 44, of an athletic Body, conceived with Child a little before *Christmas* 1730. upon which ensued all the usual Symptoms of Pregnancy. Soon after Conception, some Fellows who travel the Country, with a *Bear* and a *Monkey*, placed themselves before the Woman's Door, in order to make Diversion for the *Populace*. The *Monkey* had a Hood on, which reached to his Shoulders, of which the Woman took prodigious Notice; and all the time the *Monkey* was playing his Tricks, in turning over a Stick, &c. The Woman

Woman could not keep her Eyes off from him. Some small time after, the Woman met a Man of a thin, pale, dismal Aspect, upon whom she looked very earnestly, and thought his Face to be (to a Tittle) like the *Monkey's* Face. When the Woman was quick with Child, and the *Fetus* began to move, the Woman felt it turn over and over, many times successively, just as the *Monkey* turned over the Stick; and as often as it moved, it was in the same Manner. In the 7 Month of her Pregnancy, she was taken ill, with a Vomiting, Gripes, and Looseness, which soon ceased without the Help of Medicine; upon which the Woman's Belly began to grow less, and the *Fetus* did not move so often, nor so strong, as before. The Woman began to be very uneasy, thought her Case dangerous, and that she was not with Child; upon which she consulted me. I examined how she was from the Beginning, and found her Case as above related: I then gave it as my Opinion, that she was with Child, and begged she would not take any Medicine, until her Time of Reckoning was expired, which (with much Difficulty) I prevailed upon her to consent to. I was sent for in a Month after, and was desired to give her something to bring down her great Belly, she believing herself not with Child. I was still of Opinion she was with Child, and told her, that what she felt move in her Belly, was in all Probability a Child; and the Fulness of her Breasts, and other Symptoms, were strong Proofs of her being with Child. I endeavoured to convince her, that there was no Danger in her Case, as far as I could apprehend; she being then in tolerable good Health, and able to attend the Affairs of her Family. I again prevailed upon her to desist from taking Medicines for a Month longer: The Month elapsed, and no great Alteration. She felt something move faintly about the Expiration of the 9th Month, when I visited her, and was then in tolerable good Health, though very uneasy at her great Belly: I told her, that she might be mistaken in her Reckoning, and that she would go a Month longer: She was positive she was not mistaken, for that she had missed her *Menstrua* some time before *Christmas*, which she never used to miss, but when with Child; and now she could not believe herself with Child, by reason her full Time of Pregnancy was expired. I told her the Danger of taking purging Medicines, whilst she was with Child; and gave her Instances in the Neighbourhood, of the fatal Consequences of some Mens Practice in the like Case; by which I again prevailed upon her to tarry another Month, at the Expiration of which I gave my Patient a Visit, and found her much as she was when I saw her before. Now Ten *Lunar* Months were elapsed, and my Patient felt nothing move in her Belly for 6 Weeks past: I then confessed I had mistaken her Case, but gave her Hopes there was still a Probability of removing her Distemper, and restoring her to Health; in order to which I immediately sent her an Infusion of *Sena*, *Rhubarb*, *Sal. Tartar. &c.* cum *Syr. de Rhamno*, which she did not

take for two Days after, being the 5th of September 1731. My Patient took the Potion about 5 in the Morning, and before 6 she was taken with the most exquisite Travail-pains: A Messenger was dispatched for me, but, before I could come to her Assistance, she was delivered; the *Fætus* came, with the *Placenta*, *Membranes*, and *Humours*, all whole, which were preserved until I came, which was soon after; and, to my great Surprise, found the *Fætus* as before-mentioned. I took out my Incision-knife, and divided the *Membranes*; so took out the *Fætus*, with the Twist in the Navel-string, as it now appears; the *Membranes* were very strong, but the *Humours* were very foul, and but small in Quantity, though not fetid. My Patient, who is a Woman of Probity and good Understanding, declared, from strong Reasons, that she conceived at the Time above-mentioned, and was delivered as mentioned before; the Twists in the Navel-string are Demonstration, that the *Fætus* moved in the *Matrix*, in the Manner my Patient described. I need not here mention the exact Resemblance of the *Fætus* to a hooded *Monkey*: The *Fætus* itself will shew it more particularly than I can relate it.

*A remarkable
Conformation,
or Lusus Na-
turæ, in a
Child; by C.
Warwick,
Surgeon, in
Truro, Corn-
wall, No.
464 p. 152.
Read July 1.
1742.*

VI. About April 1741. one *Sarah Allen*, of the Parish of *St Blazy*, near *Truro*, having been married near 4 Years, and Mother of 2 Children, well-formed and living, was brought to-bed of my present Subject, but of so remarkable and preternatural a Constitution, as must render it's whole Life inevitably miserable, the Particulars whereof, from my repeated Observations, are as follows:

The *Umbilicus* is nearly in it's natural Site, but somewhat large and prominent, having more the Appearance of a Tumour, than the ordinary irregular Shape of that Organ.

Immediately below this *Umbilicus*, is a large fungous Excrecence, nearly the Size of a small Egg, but somewhat depressed, of a fiery Aspect, and exquisitely sensible. The Surface is irregular, being composed of divers Granulations or small Lobes of Flesh; and the Basis of it I could not well discover, my Endeavours being attended with much Pain and Difficulty; however, from the branchy Top of it, I am inclined to think it somewhat pendulous.

Beneath, adjoining to this *Fungus*, is another pretty large Excrecence, neither sensible nor spongy, as the former, but of a solid uniform Contexture. It's Projection from the *Abdomen* is about $\frac{1}{2}$ of an Inch, and, was there a Section made parallel to it's Basis, it would be of an Elliptical Figure. In Shape and Dimensions it somewhat resembles the *Glans Penis*, it's Surface being covered with the same fine *Membrane*, and has a small Indenture in the Top of it, but it is not so large, and has no Aperture in it.

Suspended to this *Glans*, like the *Omentum* to the *Ventricule*, is a large *Membrane* of a semilunar Figure, loose, flexible, and when turned up, capable of covering some Part of it. It's Texture nearly resem-
bles

bles that of the *Præputium*, or is somewhat thicker. There is likewise a small Cord or *Frænum*, which arising from the Circumference of this *Membrane*, and bisecting the above *Glans*, terminates under the *Fungus*. About half an Inch below this *Membrane*, is a wrinkled Exuberance resembling a *Scrotum*, but of an uncertain Magnitude, great or small, as the Descent of the Infant's *Intestines*, which having broken their natural Confines, form an unseemly Roll from one *Inguen* to the other. It's Situation is about the upper Edge of the *Os Pubis*, which, in examining this Part, I found greatly deficient, and I am apt to believe, from the great Chasm which I perceived there, it must be entirely wanting.

The next Thing to be observed is the *Anus*. I found the Situation of this Part more forward than usual, at least by 2 Inches; and, if my Conjectures be right, the *Rectum*, from this Position, must take it's Course nearly through the Chasm of the *Os Pubis*.

Besides all these Inconveniences, to complete the Child's Misery, there is a perpetual Distillation of Urine from some unseen Passages under the *Fungus*, exciting by it's Acrimony, every Moment, Pains and Excoriations.

To conclude: It's Sex is so imperfect, and obscurely represented, that it received no Baptism till 4 Months after it was born; when it's Parents, flattering themselves that Nature might take a Turn some time or other for the Child's Advantage, gave it an Appellation applicable to either Sex, as Time and Circumstances should require.

A. Umbilicus. B. *Fungus*. C. C. *Prolapsus*. D. *Glans*. E. *Membrana*. F. *Scrotum*. G. *Anus*. H. *Frænum*.

VII. Normandy furnished us some Years ago with a Child, monstrous by it's Size, and a Strength which it's Age could not naturally afford. It was born at *Roüan*, and is a Prodigy of Virility, of 3 Years and 2 Months of Age, perhaps one Month older, and is now in the Hospital at *Roüan*. It has a very large Neck, the Breast very broad, and the Belly bigger than in it's natural State. The upper Part of the Thighs is a little thickish, the rest is conformable to it's Age. He has Hair only about the Privy Parts; the *Penis* is 3 Inches long when there is no Erection, but of 6 when there is any. They have found him to have Emissions. The Fact is very true, and M. Le Cat, F. R. S. a Surgeon at *Roüan* has fully traced it out.

VIII. In order, to give you, in some Measure, a View of the Design of this little Book, I am to inform you, that the general Opinion of the World is, that there are *Hermaphrodites* in human Nature. In this Treatise I am to shew it cannot be; which I have endeavoured to do in the following Method, viz.

1. The Introduction, which is chiefly historical, lays down the Manner of this Error's being propagated amongst *Jews*, *Pagans*, and *Christian*, at all Times; with an Account of *Jewish*, Civil, and Canon

Explanation
of the Figure.
Fig. 149.
A Child of a
monstrous
Size, by M.
Geoffroy,
F. R. S. and
Member of the
R. Acad. of
Sciences at Pa-
ris, No. 471.
p. 627. Read.
Dec. 22.
1743.

Account of a
Book intituled
a Mechanical
critical In-
quiry into
the Nature of

Hermaphro-
dites; by
James Parsons
M. D.
F. R. S. given
by the Author.
No. 459. P.
650. Jan.
&c. 1741.

non Laws made against such as were reputed *Hermaphrodites*, as well as those that were always in Force at *Rome*, by which great Numbers of People were destroyed from Time to Time.

2. The First Chapter exhibits many Reasons against a Possibility of their Existence in human Nature; with a true Discovery of such Diseases as have been the Cause of Men and Womens being called *Hermaphrodites*.

3. The Second Chapter is a critical Account of the Causes Authors have assigned for the Produce of *Hermaphrodites*; wherein it is proved, that no such Effects could arise from those Causes; and several Absurdities are exposed in the Arguments advanced for the Support of this Error.

4. The Third Chapter is a critical View of the Histories of *Hermaphrodites* given by several Authors; shewing that those so reputed were either perfect Men or Women, having only some Deformity or Disease in the Parts of Generation.

5. The Conclusion describes the State of all Female *Fætuses*, with some Observations, which prove that every Female *Fætus* may as well be thought an *Hermaphrodite*, as any that were ever called so.

C H A P. IX.

Period of Human Life.

The Bills of Mortality for the Town of Dresden, for a whole Cen- tury, viz. from the Year 1617 to 1717, containing the Numbers of Marriages, Births, Buri- als, and Com- municants. Communicated by Sir Conrad Sprengell, M. D. F. R. S. No. 428. p. 89. Apr. &c. 1733.	I. The Year	Couples married.	Christ- ned.	Buried.	Commu- nicants.	Who received Holy Orders.
	1617	126	478	639	21507	among whom } 37 were }
	1618	175	466	400	22567	31
	1619	148	530	332	23221	34
	1620	119	546	472	22850	36
	1621	146	546	491	23988	18
	1622	144	521	381	24032	16
	1623	127	541	421	25864	20
	1624	146	576	411	25899	15
	1625	141	543	481	26319	21
	1626	151	580	407 besides 333 who died of the Plague.	29201	27
	1627	162	548	412	26677	29
	1628	124	543	469	27085	17
						1629



Fig. 149.



Fig. 145.

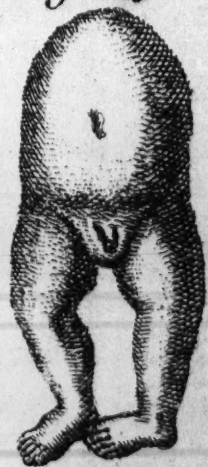
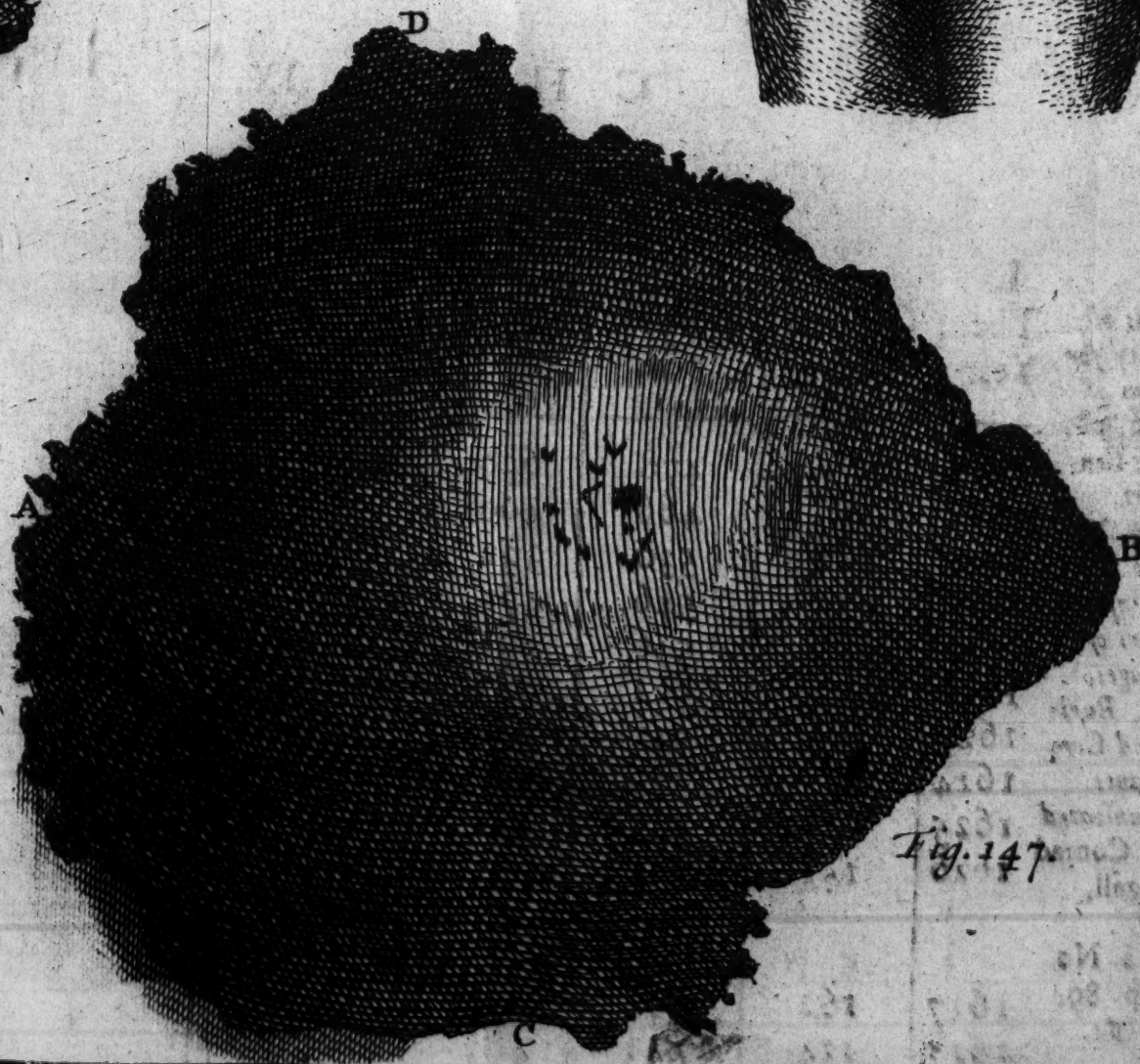


Fig. 148.



Period of Human Life.

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The Year	Couples married.	Chriftened.	Buried.	Communicants.	Who received Holy Orders.
1629	136	599	398	28525	among whom } 18
1630	115	599	480	28446	were } 28
1631	163	599	844	30241	23
1632	161	515	3129 during the Troubles of the War and Plague.	32416	46
1633	412	425	4585 the Troubles of War and the Plague still continuing.	27688	57
1634	346	531	721	23165	47
1635	205	523	597	24942	24
1636	153	531	594	23904	26
1637	156	613	1897 the Plague breaking out again.	28888	19
1638	205	550	531	26744	43
1639	122	602	1845	28702	24
1640	192	451	935	26032	30
1641	144	509	525	25662	22
1642	155	514	601	27247	20
1643	137	623	1041	28720	30
1644	128	561	489	27677	28
1645	118	497	532	27602	22
1646	134	512	481	27996	9
1647	148	655	471	36619	21

In which Year they began to deliver in the Number of Communicants at Old Dresden.

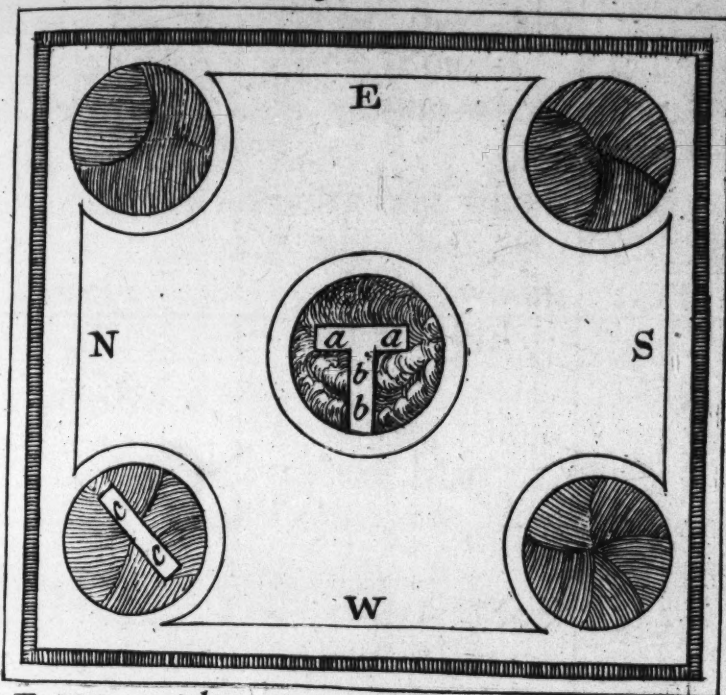
1648	190	714	606	37097	23
1649	179	664	597	39198	21
1650	197	752	494	39588	26
1651	199	713	511	39773	19
1652	206	732	450	40389	24
1653	193	673	535	40924	20
1654	194	691	558	41789	28
1655	180	725	525	40253	26
1656	212	708	560	43086	15
1657	163	610	663	44783	30
1658	186	707	518	43117	16
1659	193	703	599	43297	29
1660	219	738	542	45111	23
1661	196	709	649	45137	28

The

Period of Human Life.

The Year	Couples married.	Christned.	Buried	Communicants.	Who receiv'd Holy Orders.
1662	180	733	637	45313	among whom } 27 were }
1663	193	640	620	45640	31
1664	176	682	662	46115	42
1665	228	734	699	46667	33
1666	188	699	824	47194	32
1667	247	754	823	47325	20
1668	237	739	703	48403	17
1669	215	833	794	48765	27
1670	251	802	776	50121	22
1671	262	844	743	51500	26
1672	275	856	909	51650	32
1673	252	891	909	52483	26
1674	256	887	846	52636	19
1675	257	920	947	53179	25
1676	260	895	1284	51164	28
1677	322	988	887	53079	31
1678	204	1028	1020	53510	22
1679	308	1063	975	55296	30
1680	247	883	1311	56116	18
			besides		
			5103		
			who		
			died		
			of the		
			Plague		
1681	531	791	753	45244	18
1682	386	1137, among whom two Black- moors Children.	1023	51512	21
1683	256	1201	1200	52493	29
1684	270	1039	1154	48855	21
1685	273	984	937	50931	32
1686	244	1020	1199	53754	31
1687	285	1078, among whom a Turkish Woman.	927	49040	35
1688	274	1062, among whom 1 Turkish Woman. 3 Turkish Girls, and 1 Turkish Man.	1011	54868	23
1689	244	1022	1163	55284	21
1690	370	1002, among whom 1 Turk.	1200	57130	26

Fig. 1.



E. & W. sides
36 Yds long.

N. & S. sides
33 Yds long.

Fig. 5.

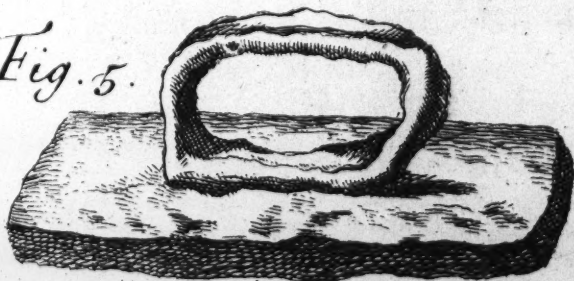


Fig. 6.



Fig. 2.

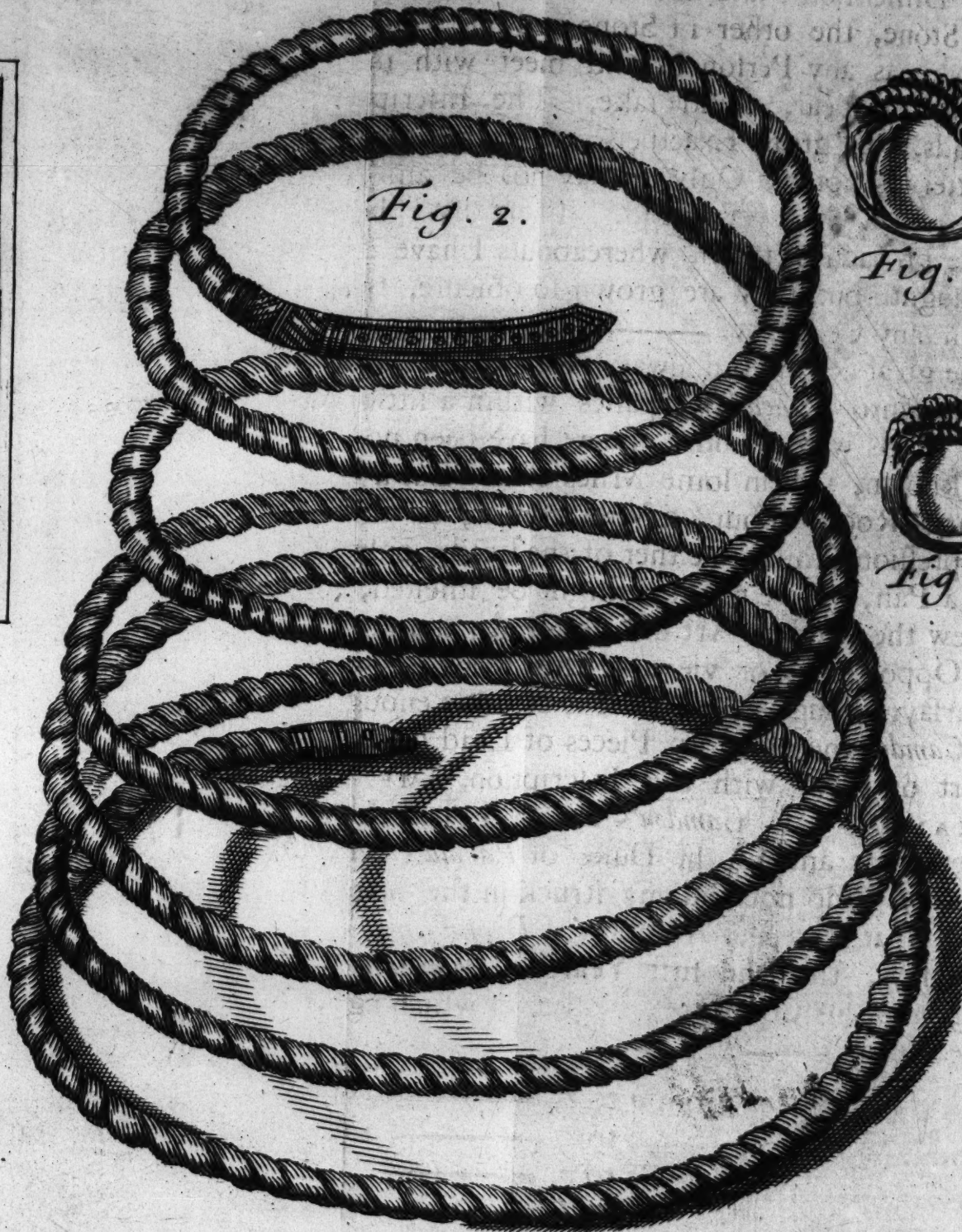


Fig. 3.

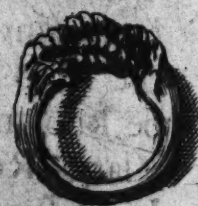


Fig. 4.

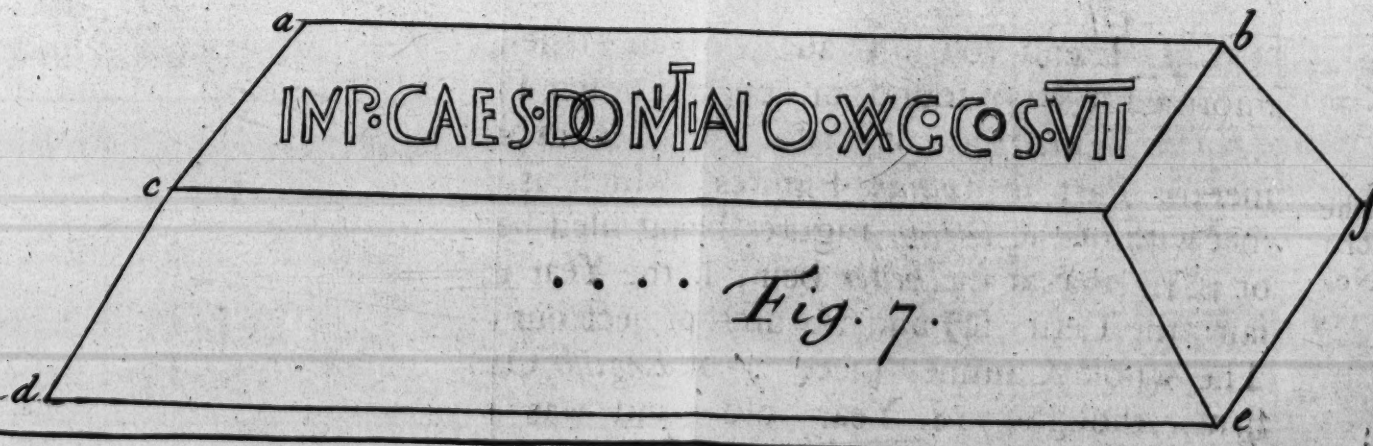


Fig. 7.

The Year	Couples married.	Christened.	Buried	Communicants.	Who received Holy Orders.
1691	306	1119, among whom 4 <i>Turkish</i> Women, 2 <i>Turkish</i> Boys, and 1 Black Woman.	1166	56629	among whom were } 33
1692	323	1003, among whom 1 <i>Jew</i> .	999	58995	18
1693	309	1096, among whom 1 <i>Turkish</i> Man.	1071	59921	29
1694	366	1014, among whom 2 <i>Turkish</i> Boys.	1426	61288	28
1695	329	1225	1227	62230	35
1696	293	1162, among whom one Black Man.	1055	64491	23
1697	480	1206	1070	61171	30
1698	332	1007	919	59030	25
1699	295	963, among them one Black Woman and a <i>Lapland</i> Man 80 Years old.	1139	59662	38
1700	292	975, among them 1 <i>Turkish</i> Woman, 2 <i>Turkish</i> Men and a <i>Jew</i> ,	1198	59369	28
1701	324	991	992	61176	27
1702	210	1086, among whom a <i>Jewess</i> .	946	60225	27
1703	288	1049, among whom a <i>Turkish</i> Woman.	1078	62636	31
1704	279	1111, among whom a Black Woman.	964	62971	39
1705	354	1044, among whom a <i>Jew</i> .	1346	64262	30
1706	313	1104	1098	63894	19
1707	296	1034	1523	63120	24
1708	350	1256	1119	66519	30
1709	348	1141, among whom a <i>Jew</i> and his Wife.	1340	67021	41
1710	337	1141, among them 2 <i>Jews</i> , who apo- statized afterwards.	1214	69197	24
1711	313	1181	1222	70123	29
1712	354	1227	1140	72432	22

Period of Human Life.

The Year	Couples married.	Christened.	Buried	Communicants.	Who received Holy Orders.
1713	353	1112, among whom one <i>Turkish</i> Man, and one <i>Jew</i> .	1383	71600	among whom are 23
1714	306	1312, among whom a <i>Jew</i> .	1250	75547	33
1715	349	1249, among whom a <i>Jew</i> .	1353	76155	23
1716	361	1339, among whom one <i>Black</i> Man, one <i>Jew</i> , and one <i>Jewish</i> Girl.	1274	77146	27
1717	397	1443, among whom a <i>Jew</i> .	1908	78019	19

Sum Total from 1617 to 1717 inclusive.

Married 24294 Couples, Christened 83412, Buried 98611. Communicants 4654064, among whom 1686 who received Holy Orders.

II.

The Bills of Mortality for the Imperial City of Augs-burg, from the Year 1501 to 1720 inclusive, containing the Number of Births, Marriages, and Burials. Communicated by the same. Ibid. P. 94.

N. B. The Years marked +, denote the Time of Plague, or Contagious Distempers.

	The Year	Born	Couples married	Died		The Year	Born	Couples married	Died
	1501	1764	643	1982		1517	1890	419	1893
	1502	1984	440	1543		1518	1980	418	1872
	1503	1764	542	1646		1519	1760	419	1893
+	1504	3048	985	4765		1520	1542	320	1760
+	1505	2464	648	3564	+	1521	2970	322	3895
	1506	1974	764	1950		1522	1765	372	1980
	1507	1876	665	1754		1523	1822	382	1970
	1508	1764	444	1844		1524	1824	392	1989
	1509	1878	347	1764		1525	1827	435	1515
	1510	1976	765	1979		1526	1829	436	1418
+	1511	2897	896	4870		1527	1833	438	1522
+	1512	1768	786	2980		1528	1763	439	1632
	1513	1875	760	1960		1529	1783	440	1733
	1514	1985	645	1740		1530	1973	442	1893
	1515	1895	692	1622		1531	1853	445	1763
	1516	1470	410	1732		1532	1640	562	1543

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	The Year	Born	Couples married	Died		The Year	Born	Couples married	Died
	1533	1765	573	1172		1577	1721	386	1427
	1534	1985	583	1282		1578	1687	403	1410
+	1535	1410	593	13000		1579	1629	388	1520
+	1536	1515	770	1492		1580	1635	416	1522
	1537	1519	784	1462		1581	1477	456	1185
	1538	1518	636	1565		1582	1627	414	1536
	1539	1922	639	1575		1583	1497	452	1245
	1540	1842	645	1585		1584	1614	311	1167
	1541	1283	496	1208	+	1585	1568	435	2497
	1542	1439	507	1472	+	1586	1583	526	3136
	1543	1282	660	1283		1587	1541	578	1545
	1544	1473	887	1179		1588	1583	420	1468
	1545	1483	440	1065		1589	1664	426	1372
	1546	1603	370	1356		1590	1592	405	1678
+	1547	1646	630	3480	+	1591	1520	410	1352
	1548	1705	492	1227	+	1592	1632	363	3450
	1549	2038	819	1757		1593	1581	649	1554
	1550	1205	411	1490		1594	1629	396	1560
	1551	1867	360	1455		1595	1517	335	1584
	1552	1567	417	1477		1596	1639	437	1505
	1553	1677	498	1665		1597	1608	393	1594
	1554	1270	445	1464		1598	1552	380	1631
	1555	1497	526	1340		1599	1486	386	1447
	1556	1587	447	1239		1600	1621	499	1775
	1557	1520	417	1310		1601	1575	387	1570
	1558	1670	488	1485		1602	1468	453	1567
	1559	1763	467	1555		1603	1570	390	1488
	1560	1297	613	1990		1604	1551	394	1298
	1561	1150	488	1310		1605	1272	394	1361
	1562	1717	454	1744		1606	1587	376	1371
+	1563	1869	460	2680	+	1607	1577	361	2595
+	1564	1872	536	2542		1608	1526	578	1476
	1565	1779	538	1488		1609	1648	477	1469
	1566	1861	418	1518		1610	1618	435	1941
	1567	1723	424	1718		1611	1557	466	1891
	1568	1757	440	1703		1612	1596	410	1625
	1569	1838	446	1396		1613	1572	437	1722
	1570	1884	334	1640		1614	1713	404	1444
+	1571	1521	318	3071		1615	1460	368	1771
+	1572	1634	650	3306		1616	1591	446	1631
	1573	1629	549	1371		1617	1655	429	1514
	1574	1488	382	1520		1618	1824	414	1354
	1575	1563	384	1595		1619	1688	419	1485
	1576	1647	442	1245		1620	1725	463	1667

T t 2

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Period of Human Life.

	The Year	Born	Couples married	Died		The Year	Born	Couples married	Died
	1621	1661	443	1517		1665	624	272	745
	1622	1696	435	1959		1666	690	209	737
	1623	1374	451	1875		1667	754	193	769
	1624	1512	383	1370		1668	688	228	711
	1625	1482	386	1392		1669	793	192	743
	1626	1431	299	1440		1670	707	228	734
+	1627	1198	313	2494		1671	810	210	733
+	1628	1106	411	9611		1672	830	197	768
	1629	1121	860	1265		1673	786	239	751
	1630	1052	272	909		1674	874	251	842
	1631	1173	169	859		1675	775	201	913
+	1632	1286	355	3485		1676	805	230	913
+	1633	1075	537	3364		1677	843	224	934
+	1634	1054	299	4664		1678	854	239	943
+	1635	512	416	6243		1679	861	250	945
+	1636	789	440	790		1680	807	281	976
	1637	801	213	823		1681	888	214	860
	1638	809	209	638		1682	891	214	734
	1639	811	239	674		1683	892	195	808
	1640	843	217	586		1684	894	234	858
	1641	843	176	587		1685	885	230	848
	1642	832	248	593		1686	910	247	981
	1643	839	194	638		1687	853	281	855
	1644	841	189	659		1688	927	231	860
	1645	904	172	758		1689	853	213	806
	1646	1221	206	1488		1690	911	262	1071
	1647	944	256	1338		1691	825	253	785
	1648	1482	225	1208		1692	893	202	935
	1649	776	233	940		1693	818	219	1084
	1650	639	191	533		1694	760	277	1106
	1651	665	190	577		1695	867	262	1048
	1652	692	178	616		1696	930	274	927
	1653	686	150	575		1697	969	271	777
	1654	694	197	764		1698	1020	241	879
	1655	680	158	570		1699	1008	268	940
	1656	700	182	641		1700	909	217	786
	1657	675	182	731		1701	933	230	906
	1658	659	198	731		1702	952	249	900
	1659	687	187	831		1703	989	190	1245
	1660	657	211	657	+	1704	818	339	3113
	1661	710	179	668		1705	890	405	748
	1662	644	192	788		1706	949	307	842
	1663	675	207	836		1707	1013	240	805
	1664	687	224	761		1708	916	225	908

The

The Year	Born	Couples married	Died	The Year	Born	Couples married	Died
1709	948	240	805	1715	866	309	1024
1710	982	238	811	1716	997	272	905
1711	899	243	855	1717	924	259	988
1712	911	229	894	1718	986	280	768
1713	837	202	860	1719	924	270	997
1714	874	261	948	1720	909	263	934

III. By the first Septenary of the Centenary of the Bills of Mortality for the City of *Dresden*, from 1616 to 1624, it appears that there died in that Electoral Capital 3136 Persons; and in the last Septenary of the said Centenary, from *Anno* 1709 to 1717, 8836.

And by the first Septenary of the same Centenary of the Bills of Mortality of the Imperial City of *Augsburg*, from 1616 to 1624, it appears that there died in that City 11371; and in the last Septenary, from 1709 to *Anno* 1717, only 6297; whereby is evinced the great Vicissitudes of sublunary Affairs, in the vast Disparity between the aforesaid Cities; for as the former has increased near $\frac{2}{3}$ in the Number of it's Inhabitants, so hath the latter decreased near $\frac{1}{2}$ in the said Space of Time.

IV. A Survey being taken about *Michaelmas* 1733, of the Inhabitants of *Stoke-Damerell* in the County of *Devon*, the Number of Persons, Men, Women, and Children, residing in the Parish, amounted to 3361. By the Register, I find that in the same Year, 28 Couple were married. 61 Males and 61 Females baptized, and 62 People buried.

Baptized.

Buried.

Number of People.

122.

62.

3361.

Whence it appears that the Number of Persons who died, is one more than half the Number of Children born; and that about 1 in 54 died.

It is to be observed, that the General Fever, which almost all the Inhabitants of the same Place were ill of at the same time, was in part within the Year mentioned: also that one of the Persons included in the Number of those buried, was a Foreigner brought from on board a *Dutch Ship* in the River; and that 2 more were drowned from on board a *Man of War*; but the Ships Companies are not included in the Number of the Inhabitants.

Not from this Account only, but from Experience and Observations, both of my self and better Judges, I reckon the Parish of *Stoke-Damerell* as healthful an Air as any in *England*.

V. 1. Every body knows to what useful Purposes the Bills of Births and Burials at the City of *Breslau*, the Capital of *Silesia*, have been applied, by a very learned and sagacious Member of the *Royal Society*; as also what curious Observations have been made, both Moral, Physical, and Political, by Sir *William Petty*, upon the same Argument, several Years before

Remarks upon the aforesaid Bills of Mortality for the Cities of Dresden and Augsburg. By Mr William Maitland, F. R. S. Ibid. p. 93.

An Account of the Births and Burials, with the Number of the Inhabitants at Stoke-Damerell in the County of Devon. Communicated by the Rev. Mr William Barlow No. 439. p. 171. Oct. &c. 1735.

A short Account of Mr Kersieboom's Essay upon the Number of People in Holland

and West-Friesland, as also in Harlem, Gouda, and the Hague; drawn from the Bills of Births, Burials, or Marriages, in those Places. By John Eames, F. R. S. No. 450. p. 401. Oct. &c.

1738.

The Table of Contingency.

before, and Dr *Arbutnot* and others since. Our industrious Author hath not only consulted them, but acquainted himself more particularly with Mr *King's* Observations in *Davenant's* Essays, &c. in order to render himself more capable of making a just Estimate in this Matter. He begins with the Number of Inhabitants in the two Provinces of *Holland* and *West-Friesland*; these he makes at this time, viz. 1738, to amount in all to 980,000, and presents the Reader with the following Table of the Particulars. It exhibits the Number of People of all Ages, living at the same time, from the Birth to extreme old Age; which, because it shews the Chances of Mortality within the Ages mentioned, he calls the Table of Contingency of Life and Death.

Of above 90 Years old there are		500
of 90	86 inclusive	2,500
85	81	6,500
80	76	13,000
75	71	20,300
70	66	27,300
65 to	61	34,300
60	56	40,800
55	51	47,000
50	46	53,000
45	41	57,800
40	36	62,500
35	31	67,600
30	27	58,400

491,500 the Sum above 27 Years.

of 26	21	94,300
20	16	83,400
15 to	11	87,200
10	6	91,800
5 to Birth		131,800

488,500 Sum under 27 Years old

491,500
488,500

980,000 Sum of all the Inhabitants.

This Table is founded upon 3 Principles, viz. Correct Observations upon the Tables of assignable Annuities in *Holland*, which have been kept there for above 125 Years; wherein the Ages of the Persons dying are truly entered: Upon a Supposition that there are yearly born in the

two Provinces 28,000 living Children; and lastly, that the entire Number of Inhabitants in any Country is to the Number of the Births as 35 to 1.

This Table was sent some time after it's Composition to Professor *s'Gravesande*, F. R. S. to know his Thoughts, as well concerning the Justness of it, as it's Fitness to ascertain the Value of Annuities on Lives; and, as he tells us, it met with the Professor's Approbation.

From this Table it appears, (1.) That about half the Number of People in the two Provinces are above 27 Years old, and consequently that near the other half are under that Age: (2.) Then, by following what hath been observed for more than 100 Years in *England*, and particularly in *London*, out of 35 Children born, 18 of them are Boys, and 17 Girls, the People in these two Provinces will consist of

504,000 Males.
476,000 Females.

980,000.

He farther remarks, that it appears from the assignable Annuities for Lives mentioned before, the Females have in all Accidents of Age lived about 3 or 4 Years longer than the same Number of Males; which he looks upon to be appointed as a Compensation for the continual Excess there is in the Birth of the Males above the Females.

Having considered the Quantity, he then comes to take notice of the Quality of these 980,000 Inhabitants, and says he sees no Reason to differ from the Proportion of Mr *King* in *Davenant's* Essays, who with a great deal of Pains and Judgment hath divided the People of *England* in this manner:

The Proportion for every 100,000 Inhabitants is,					
Married Men and Women	—	—	—	—	34,500.
Widowers	—	—	—	—	1,500.
Unmarried young Men and Children	—	—	—	—	45,000.
Servants	—	—	—	—	10,500.
Travellers, Strangers, &c.	—	—	—	—	4,000.
					100,000.

If this Proportion be admitted, then the Number of each Sort in *Holland* and *West-Friezland* will be as you have underneath. He adds, that the said Provinces can raise at this Time 220,000 able-bodied Men, deducting $\frac{1}{10}$ for Diseases and other Infirmities. But then he admits at 16 years of Age, whereas Dr *Halley* admits none till 18, Persons under that Age being generally too weak to bear the Fatigues of War, and the Weight of Arms. He then proceeds to rectify the Mistakes of the learned *Isaac Vossius*, who makes but 550,000 in *Holland*, *West-Friezland*, &c. disallows Sir *William Petty's* Account of the Number of People in *London*.

Period of Human Life.

London, because he makes them alone equal to the Inhabitants of *Holland* and *West-Friezland* together.

He closes the whole with a Table of the present Values of Annuities upon Lives, in Proportion to the ordinary or common Bonds charged upon those Provinces, and subject to the extraordinary Taxes raised at this Time, viz. 1738. You will find annexed, the Degrees of Mortality, or Fatality, said to be in the *Hague* and *Haagambagt*, as also the Numbers and Conditions of the Inhabitants of *Amsterdam*, *Harlem*, *Gouda*, and the *Hague*, not omitting *London* at this present Time.

The two Provinces of <i>Holland</i> and <i>West-Friezland</i> .		<i>Amsterdam</i> .	<i>Harlem</i> .	<i>Gouda</i> .	<i>Hague</i> .	<i>London</i> .
Married Men and Women, }	338000	86156	17420	6900	14850	241800
Widowers,	14700	4218	760	300	720	13100
Widows,	44100	13858	2280	900	2380	45700
Unmarried Youth and Children, }	441000	93990	22700	9000	16190	215700
Servants,	102900	28318	5300	2100	4870	85000
Travellers, Strangers, &c. }	39300	14460	2040	800	2490	52300
Total	980000	241000	50500	20000	41500	653600

The Fatality of the Quarters. *dead*. The Fatality of the Months 31 Years, one with another.

Spring to Summer	307
Summer to the Autumnal Equinox	286
Autumn to Winter	287
Winter to Spring	286

	<i>dead</i> .
<i>January</i>	102
<i>February</i>	88
<i>March</i>	95
<i>April</i>	77
<i>May</i>	112
<i>June</i>	100
<i>July</i>	92
<i>August</i>	95
<i>September</i>	99
<i>October</i>	93
<i>November</i>	95
<i>December</i>	99

Hence it appears, that *March* is less fatal at the *Hague* and *Haagambagt* than *April*, and *April* than *May* and *June*; that *May* is the most fatal Month of all; that the remaining Months are nearly equal. It appears

appears further, that three Parts or Seasons of the Year are very nearly equal; but that the other Quarter or Season, beginning at the Vernal Equinox, is more fatal than any of the rest by one fifteenth Part.

A TABLE of Annuities for Life.

Let the Annuity be 100 Guilders a Year, upon a Life under a Year old.

				Guild.	Guild. Sti.	
It's present Value is — — — —				1667	that is 6	0 per Cent.
Upon a Life of 5 Years to 1 inclusive				1869	5	7
10	6			1835	5	9
15	11			1770	5	13
20	16			1667	6	0
25	21			1587	6	6
30	26			1515	6	12
35	31			1429	7	0
40	36			1334	7	10
45	41			1212	8	5
50	46			1093	9	3
55	51			971	10	6
60	56			840	11	8
65	61			709	14	2
70	66			570	17	11

U S E.

Question, Let it be desired to know the present Value of any Annuity for Life, for Instance, of 90 Guilders a Year, which was granted in the Year 1703, upon a Life then of three Years old.

Answer, The Life now (in 1738) is between 37 and 38 Years old; hence the Number between 40 and 36 gives 1334, for the present Value

of an Annuity of 100 Guilders; hence $\left(\frac{1334 \times 90}{100} = \right) 1200$

Guilders is the present Value of the Annuity for that Life.

There are other Uses mentioned; but for these I refer to the Essay itself.

2. Some time ago an Abstract of a Political Essay, written by Mr W. Kerffseboom, a Dutch Gentleman, (intituled, *Verhandeling tot een Proeve om te weet en de probable Menigte des Volks in de Proventie van Hollandt en Westvrieſlandt*) was read before this Honourable Society; wherein the Author, to the great Disparagement of the City of London, *An Answer to that Part of Mr W. Kerffseboom's Essay, which treats of the Number of*

the Inhabitants
of London; by
W. Maitland,
F. R. S. Ibid.
p. 407.

has asserted*, that the City of *Paris*, in the Year 1684, and at the close of the last Century, contained more Inhabitants than the City of *London*.

And to prove that *Paris* contains a greater Number of Inhabitants than *London*, he has had recourse to the Accounts of Christenings annually published in both Cities, without giving himself the Trouble to inquire into the Nature of those his Authorities; which if he had, he would soon have discovered, that the former, is a perfect Account, while the latter, is perhaps the most defective of any extant; for the Christenings therein mentioned, are only those whereat the Parish Clerks are present: which, I am of Opinion, cannot amount to near $\frac{2}{3}$ of the whole, as I shall endeavour to make appear.

The Burials in the annexed Table, by some Typographical Errors in the Political Account of my History of *London* †, from which it is taken, being increased 491 above the real number, in *Graunt's* Account ‡, the Sum Total whereof, amounting to 90350, must be reduced to 89859; and as in the annexed Term of Years, there appears to have died of the Plague 1741 **, three and a half of which, I compute, would have died of common Distempers, out of each Hundred, which amount-

ing to about 61, the same being deducted from 89859, the real Number of the Burials, the Sum will be reduced to 89798, which taken from 90883, the Number Total of the Christenings, the remaining Sum will be, 1085, which being divided by ten, the Medium thereof will be 108 $\frac{1}{2}$ yearly in Favour of the Christenings.

A Decenary account of the Christenings and Burials of *London*, in the following Years.

Years.	Christened	Buried. Com. Dist.	Buried Plague.	Totals Buried.
1626	6701	7400	134	7534
1627	8408	7713	4	7717
1628	8564	7740	3	7743
1629	9901	8771	0	8771
1630	9315	9228	1317	10545
1631	8524	8288	274	8562
1632	9584	9527	8	9535
1633	9997	8392	0	8392
1634	9855	10899	1	10900
1635	10034	10651	0	10651
Tot. Gen.	90883	88609	1741	90350

This Difference in Favour of the Christenings, is owing to the Citizens of that Time being almost of the same Religion; but the Civil War breaking out soon after, the People deviated into a Variety of Sects, subverted the Church of *England*, and assuming the Civil Power, established a new Hierarchy, or Church Government. But the Mem-

* *Kerffseboom's* Verhandel. p. 14. ib. 17.

† *Graunt's* Nat. and Polit. Observ. 3d Edit. Lond.

‡ *Maitland's* Hist. Lond. p. 535.

** *Maitland's* Hist.

Lond. p. 535.

bers of the abolished Church continuing to baptize among themselves, (without reporting their Christenings to the new-appointed Members of the Company of Parish-Clerks) occasioned a very great Defect in the account of Christenings annually published by the said Parish-Clerks.

From this *Epocha*, is to be dated the Majority of the Burials in the Bill of Mortality over the Christenings of *London*: and though the Church of *England* was soon after re-established, yet the numerous Dissenters of all Denominations, persevering in their Separation, continued to baptize within themselves, without sending in Accounts of their Christenings to the restored Members of the Company of Parish-Clerks; and the Schism still continuing, the Accounts of the Christenings and Burials of this City remain upon the ancient Foot of Division and Imperfection.

Add to this, that not only all the foreign Churches in *London* christen within themselves, but likewise many Churches and Chapels of the Church of *England*, that send not in their Accounts to the Company of Parish-Clerks, which, together with those of the Dissenters and Foreigners of all Denominations, amount to no less a Number than one hundred and eighty-one Congregations, whose Accounts of Christenings are not published: By which it is evident, that the vast Disparity between the Christenings and Burials of this City, is not owing, as Mr *Kersseboom* vainly imagines*, to the Residence of the Court, Convention of Parliament, and great Resort of People from all Parts, but in Fact to the great Defect abovementioned.

However, that Gentleman, from the aforesaid very defective Account of the Christenings of this City, has calculated the Number of it's Inhabitants by a Medium of the Christenings in the Years 1684† and 1685; whereby he makes the Number at that Time amount to 500,344: But as this Number, is only taken from a Medium of two Years, he imagines it too great; therefore to reduce the same to the Number of 469,700, by a Medium of 20 Years, he has unwarrantably precluded the Sum of 14,702, the Number of Christenings in the Year 1684, to make room for the Sum of 11,851, the Number of Christenings in the Year 1674; whereby the Number of the Inhabitants of *London*, is very much lessened.

And as a farther Instance of Mr *Kersseboom*'s Partiality in Favour of the City of *Paris*, he has calculated the Number of it's Inhabitants (without mentioning the Uncertainty of a Calculation founded on a short Space of Time, as he has done in the Case of *London*) at a Medium of the Christenings for the Years** 1670, 1671, and 1672, whereby he makes them at that Time, amount to, 610,300; adding, the Number

* *Kersseboom's Verhandel.* p. 25.
ibid.

** Ibid. p. 16.

† *Kersseboom's Verhandel.* p. 14.

|| Idem

must have been greater at the End of the last Century; as by his extravagant manner of Calculation it should be at present.

But as it appears by the above-specified ten Years Account, that the Christenings of *London* greatly exceed the Burials of that Time, I think it will not be denyed, that they exceed the same at present; especially if we consider, that the Number of Christenings in *Paris*, at a Medium of 9 Years (preceding that of 1737) exceeded that of the Burials 98 yearly; notwithstanding that City, not only abounds with a vast Number of Religious of both Sexes, who are sworn to Celibacy, but likewise many Thousands of Students belonging to the University, who lead a single Life; whereas in *London*, there are no such Persons, to prevent the Increase of it's Inhabitants.

And as in my Political Account of *London*, it appears*, that at a Medium of 9 Years, there are annually buried in *London* 29,542, and in *Paris* only 17,804, which is 11,738 in Favour of the former; so must the Births in *London* at present (according to the above-specified ten Years Account, the Reasons aforesaid, and the *Paris* Account of Christenings) yearly exceed those of *Paris* 12,320; whereby is shewn, that the Inhabitants of *London* exceed those of *Paris* above $\frac{1}{3}$ in Number.

By what has been said, I doubt not but Mr *Kerffeboom's* Astonishment will not only cease, in respect to the great Difference between the Christenings and Burials of *London*; but he will be likewise induced to do Justice to this injured City, by acknowledging that the Inhabitants thereof vastly exceed those of *Paris* in point of Number.

What Mr *Kerffeboom's* Partiality in Favour of the City of *Paris* is owing to, I know not; unless it be out of Pique to Sir *William Petty*, (with whom he seems not well pleased) for saying, that the City of *London* contained as many Inhabitants as the Province of *Holland* and *West-Friesland*: Which, I think, will be no difficult matter to make appear, by allowing that Gentleman his supposed Number of 28,000† Children to be annually born in the said Province; whereas, according to the above-specified ten Years Account, and the *Paris* Proportion of Births, there must be annually born in *London* 31,008 Children; Therefore, as this Number, according to my Calculation‡, is the Produce of 725,903, the present Number of the Inhabitants of *London*; so must 28,000**, the Number of Children supposed to be born yearly in the Province of *Holland* and *West-Friesland*, be the Produce of 655,485, the present Number of the Inhabitants of the said Province. Notwithstanding Mr *Kerffeboom*, by his excessive and unprecedented reckoning of the Births at $\frac{1}{33}$ part of the People, has calculated them at 980,000; whereas by Dr *Halley's* Method of Calculation (which is so highly approved of by Mr *Kerffeboom*, that he seemingly would be thought to make it the Standard of his Calculations) the Inhabitants of the Province of *Holland* and *West-Friesland* do not amount to 29 times the Number

* *Maitland's Hist. Lond.* p. 540 and 548.

† *Kerffeboom's Verhandel.* p. 3.

‡ *Maitland's Hist. Lond.* p. 541.

** *Kerffeboom's Verhandel.* p. 3.

of the Births; which gives room to suspect, that Mr. Kerseboom has introduced this unheard-of Excess, to increase the Number of People in the said Province of Holland and West-Friesland.

3. Mr Kerseboom having advanced in his *First Treatise*, that the Provinces of *Holland* and *West-Friesland* contained 980,000 Souls, of all Ages, on a well-grounded Supposition, that annually are born in the said two Provinces 28,000 Children alive; but it having been the Opinion, that this should be more clearly demonstrated, has thought it necessary to comply therewith. In order to which, the Author has divided the Provinces into three general Divisions, distinguished with the Letters A, B, C; and given the Names of the several Cities, Towns, and Villages, belonging to the several Letters just now mentioned; and supposes, on good Grounds, (though not on a Mathematical Enumeration, which the Author could not do, for Reasons assigned in his *First Treatise*, Page 38.) that in the First Division marked

A. —	are born alive annually	3890 Children.
B. — — —	annually	19070 and
C. — — —	annually	5040.

which is together ——— annually 28000 Children.

And, as it has been proved in his *First Treatise*, by what has been there observed, in relation to Annuities for Life; that for every Child that is born, the whole Number of People is 35 times as many; so it will prove, that these Numbers being multiplied together, it renders 980,000 Souls.

But as it was impossible for the Author (as has been hinted before) to get an exact Account, from all Places, of the Births, Weddings, and Burials, (from which two last the First is to be cited and proved) he proceeds to give you the chief Observations he was able to obtain; and believes that these, joined with those contained in his *First Treatise*, will be a sufficient Proof to his general Calculations.

Mr Kerseboom then goes on, with giving an Account how many People were buried in the City of *Dort* every Year, from 1700 to 1739 inclusive, amounting, in 40 Years, to 28,977 Persons; which is annually, on an Average, 724. — The Marriages are 202 Couple annually, during the same time, which should produce (according to the Author's Calculations in his *First Treatise*, Page 24.) 325 Children *per* 100 Marriages, and consequently 656 Children *per Annum*; but has found it, on an Average, to be 651. — This City being a Sea-Port, and driving a large Trade to *Scotland*, and on the *Rhine*, and consequently many of the People, whose Traffick brings them to *Dort*, may die there, it is supposed, that about 680 Children are born annually there, and that consequently this City may contain 24,000 Souls.

Extract by
John van Rix-
tel, F. R. S.
of Mr W.
Kerseboom's
Second and
Third Treatise,
confirming the
Manner how
to know the
probable Quan-
tity of People in
the Provinces
of Holland and
West-Fries-
land, besides a
Foundation on
which to prove
the probable
Lives of Wi-
dows, and like-
wise a Rule
whereby to
know the Du-
ration of Mar-
riages. No.
468. p. 315.
Read Jan. 27.
1742-3.

Next to this, the Author gives an Account of *Haerlem*, how many People died there in 84 Years, from 1656 to 1739 inclusive, namely, 132,132 Persons, which is annually, on an Average, 1573. — The next is, how many Marriages from *Anno* 1690 to 1739 inclusive, namely, 21,910, is annually 438, on an Average. — About the Births, Mr *Kerffjeboom* refers to his First Treatise, Page 54, where he supposes, that 1450 Children may be born alive annually; and endeavours to demonstrate it further, by giving an Account of the Births for 60 Years, namely, from 1680 to 1739, and finds it to be 1453; from which it is calculated, that this City contains 50,500 Souls as mentioned in his First Treatise.

The next Account is that of the Burials of *Delft* and *Delftshaven*, from the Year 1724 to 1739, being 15 Years, and is found to be annually, on an Average, 723 Persons; but there is subjoined, for the greater Certainty, an Account from the Year 1696 to 1739, which proves it to be 748 Persons annually.

The Marriages are in the same Time of 44 Years, on an Average, 224 *per Annum*, which should produce 728 Children, according to the Rule laid down before, namely, 100 Marriages producing 325 Children; but is found to produce from 1690 to 1739 inclusive, to be 648 *per Annum*, on an Average; from whence it is supposed those two Places contain 25,000 Souls.

The City of *Leyden* comes next in Consideration. It appears by a List for 50 Years, namely, from the Year 1690 to 1739 inclusive, that there have been buried in that City annually, on an Average, 1919 Persons; and married during the same Time, annually, on an Average, 558 Couple, which, agreeable to the former Rule, would produce 1813 Children *per Annum*, but is found to have been 1834 *per Annum*, on a Medium, as aforesaid; the Author concludes consequently, that this City contains 63,000 Souls.

The next City in View is *Amsterdam*: It appears by a List, that since the Year 1696 to 1738 inclusive, there have been buried in this City 7323 Persons annually (*Jews* excepted); and there having been married, during the same Time of 43 Years, 2311 Couple annually, produced, according to the Author's Computation, 7134 Children annually, at a Medium; and takes it thence for certain, that *Amsterdam* contains (including 20,000 *Jews*, as observed in his First Treatise, Page 21.) 241,000 Souls. The Author proceeds, in the like curious Manner, about other Places; but least, dwelling too long on this Particular, it might prove tedious in this Place, I will proceed with observing, that the Author gives next a Table how long 432 Widows lived during a Century, and shews it to have been near 14 Years each on a Medium; and then subjoins a List how many Years married People of different Ages continue to live probably together, before the Bonds of Matrimony, by the Death of either Party, are dissolved; namely,

live between

Those whose Ages together are	40	24 and 25 Years.
— — — — —	50	22 23.
— — — — —	60	23 21.
— — — — —	70	19 20.
— — — — —	80	17 18.
— — — — —	90	14 15.
— — — — —	100	12 13.

And finishes with rejecting the Method of calculating the Quantity of People after the manner of *Vossius*, *Auzout*, *Petty*, and others. —

The *Third* Treatise contains, 1st, A Copy of a Letter written by the Author in the Beginning of the Year 1741, to Mr *Eames*, and laid before the *Royal Society* soon after, by the said Gentleman.

2^{dly}, A Demonstration, in 29 Tables, that Mr *Simpson's* Calculation of Lives, as 1 to 26, is a Mistake, and his own Hypothesis, as 1 to 35, right; and proves from Mr *Maitland's* Observations, Page 541, that Children in *London*, of two Years old, continue to live, on a Medium, above 37 Years; and observes, that Dr *Halley's* Table has it full 38 Years and a half. —

The Author supposes, 3^{dly}, That out of every 100 Children born, Five come dead into the World; and that out of every 100 Children born alive, near 20 die under a Year old; and shews, 4^{thly}, how much Mr *Simpson* differs in his Calculation; namely, That full 32, out of 100 Children, die, under a Year old. —

The rest of this Treatise consists in divers Calculations and Tables of Interest, and the Value of Annuities for Life on different Ages and Interest; and concludes with an Explanation of the same, and the Usefulness thereof.

CHAP. X.

PHARMACY and CHYMISTRY.

I. THE Knowledge of this Remedy was first purchased from a famous Negro Poisoner, at a great Expence, by one who styles himself, *Isaiab Burgefs*, Doctor of Physic; and the Secret devolved to myself, by means of a Manuscript of the Doctor's, which, amongst others, I have procured, for my *History of the Physical and Chirurgical Writers of this Kingdom*. The Author intended this little Tract, which contains Observations on the most considerable Distempers in America, should be made publick; he wrote it, at the Request of his Friends, when an Expedition was designed into *America*; and particularly declares, that he purposed the Divulgate of this specific Antidote, that such as should go to the

An Antidote to the Indian Poison in the West-Indies, by Edward Milward, M. D. No. 462. p. 2. Read Jan. 7. 1741-2.

the West-Indies, amongst the Spaniards, might meet with a Remedy in case of Necessity. What prevented the Doctor from executing this his laudable Design, I know not.

“ The Negroes, says he, use a Poison of a strange and extraordinary Nature. The Dose is very small, and it hath no ill Taste; so that, mixt with Meat or Drink, it is not perceivable. It causeth divers Symptoms, and the Effect is various, according as the Dose is large or small. It kills sometimes in very few Hours, sometimes in some Months, and at others in some Years. The Symptoms are according to the Quantity given: If great, it causeth Evacuations upwards and downwards; of Excrements first, then of Humours, and lastly of Blood, with Fainting-Fits, and Sweatings. Death follows in 6 or 7 Hours. The Negroes turn white.

“ If the Dose is but small, the Sick loseth his Appetite, feels Pains in his Head, Arms, and Limbs, a Weariness all over, Soreness in his Breast, and Difficulty of Breathing, (so that one appears as being in a Consumption) and at last dies languishing.

“ All Remedies yet publickly known, are of no Force nor Virtue against this Poison; and the Patient certainly dies. Nay, I question whether the best Cordial Remedies can put the least Stop to the Efficacy of its Venom, or retard Death, and put it off, longer than the Intention of the cunning Poisoner had fixed it, in proportioning the Dose.

“ I know that the Spaniards have knowledge of this very Poison, and am satisfied, that I have seen several *Bocaniers* die of it, given them by Spanish Women. I am also persuaded, that it is the same Poison used in Spain and Italy.

“ This Poison hath but one specific Antidote yet known; the Knowledge of which cost me very dear: And it was with much Difficulty I could persuade a famous Negro Poisoner to part with his Secret.

“ The Antidote is, the Root of the *Sensible Weed*, as it is commonly called, or *Herba Sensitiva*. It grows like a Shrub, has no Prickles, blossoms yellow, and bears little Cods, full of small black pretty Seeds, of which the Women make Necklaces and Bracelets. Take none of the Root but what is in the Ground; wash it well, and split it in two. Take a good Handful of these Roots so split, and steep them in 3 Quarts of good clear Water in an earthen glazed Pot, having a Cover. Use but a moderate Fire, that it may boil but very gently. The Decoction has no ill Taste, and you may either give it so, or add Sugar, as you shall think best. Give to the Patient a good Glass of this Decoction, as warm as he can drink it; an Hour after give another, and so for some time, as you shall think it necessary to make a perfect Cure. There is no Danger of giving too much; it can do no harm at all. Several People have taken this Decoction, though they have not been poisoned, thinking it would do them good in other Distempers; so that one who any ways suspects he has had some of that Poison given him,

“ him, may drink it very safely, and in what Quantity he pleases,
 “ The rest of the Plant is to be rejected as bad and noxious.”

The Doctor enforces his Observations by remarking, that he had been a Practitioner in those Parts for above 25 Years. Many *Negroes*, he says, were wonderfully preserved and cured by taking of this Antidote, though, for Brevity's Sake, he gives but one Instance; which is, “ of a strong *Negro* Man, about 30 Years of Age, and in perfect Health, who being one Night at a Plantation 4 Miles distant from that where he lived, was invited to drink a Dram of Rum, by another *Negro*, who mixt Poison with it. The Fellow drank it up, perceiving nothing to be in it; but as he was taking Leave, on the other's bidding him Farewel, and telling him he should never see him again, he suspected he was poisoned; and putting his Finger in his Mouth, vomited up great Part of the Poison, though there remained enough of it to cause continual Evacuations in him upwards and downwards; of Excrements first, then of Humours, and lastly of Blood. As he was coming home, he fainted away several Times, and calling at length to some Neighbour-*Negro* Houses, was brought home extremely altered; turned white, and was, as it was thought, expiring. The Root was immediately sent for, and the Decoction made, and given him in great Quantity. He continued taking it for 3 or 4 Days, and on the 5th went to work along with the rest of the *Negroes*.”

That the *Sensible Plant* is endowed with the Property of resisting Poison, hath been, before this, taken Notice of. For Sir *Hans Sloane* hath observed from *Piso*, that the Root of this Shrub is an Antidote against the Shrub itself, which is very poisonous, and kills by Degrees, making the unhappy Sufferers Cachectical, Short-winded, and Melancholy, till they die*. This greatly corroborates what our Author has advanced; and it is observable, that he likewise directs all Parts of the Plant, except that Part of the Root which is in the Ground, to be rejected, as bad and noxious: Though whether this be exactly the same Plant with what our Author mentions, I dare not determine; as Sir *Hans Sloane* enquires whether it be not the *Æschynomene*, seu *Mimosa arborescens Americana*, &c. flore albo; whereas Dr *Burges* expressly says, that it flowers yellow: though this may, possibly, be a Mistake in him.

I am sensible it may be objected, that the *Negro* Poison is of various Kinds; and that therefore, though this Remedy may be so extraordinary a Specific in some Cases, it may be unavailable in others. That the *Negroes* may have the Knowledge of different Sorts of Poison, I deny not; but it would appear, from the Universality of the Effects of this Medicine, as the Doctor affirms many have been wonderfully cured and preserved by it, and does not mention a single Instance of it's Mis-

* Nat. Hist. of *Jamaica*, Vol. II. p. 57.

carriage, as though the *Negroes* in the *West-Indies* used but *one* Kind of Poison, or, if different, yet such as comes within the Power of this Remedy. Besides, as we cannot be assured, but by the Consequence, whether the Poison be of that Sort, as to be within the Reach of this Remedy, or not, I think there is all the Reason in the World it should be administered under any Suspicion of the *Indian* Poison: Especially, as the Doctor assures us of it's great Innocence; and I believe every one will readily agree with me, that it is no small Recommendation of a Medicine, *That let what will become of it's good Effects, it can do no Harm.*

Dioscorides hath rightly observed in his *Alexipharmics*, that very different Poisons produce the same Effects upon Human Bodies; and that therefore they are, for the most part, curable by the same Remedies. For though the Kinds of Poisons are various, yet the Effects which arise from them are common, and but few. And Dr Mead is of Opinion, that though there be a great Variety of internal Poisons, as well Mineral as Vegetable, yet they do all of them seem to agree in their primary Effects, and Manner of Operation. Eff. III. And in another Place, That virulent Plants, although they may be distinguished even from one another by particular Virtues, do however kill by a like Operation and Force. From whence it seems reasonable to infer, that although Poisons may be various in themselves, yet it is not impossible they may be cured by the same Remedy; as they produce like Effects, and seem to kill by a like Manner of Operation. And a very remarkable Instance of this we have in all corrosive Poisons, whether of the Mineral or Vegetable Kingdom, which, however different in themselves, produce their Effects universally by eroding the Coats of the *Stomach*, and the *Prime Viæ*; and which are all curable in like Manner, by sheathing and blunting their acrimonious Particles, by means of smooth, lubricating, and oleaginous Medicines.

But be this as it will, I think the Remedy deserves, at least, a fair and impartial Trial, as the Author has not indulged in any rhetorical Flourishes, or Theory, but seemingly confined himself to Truth, and plain Matter of Fact. And, indeed, should it be found to succeed but *One* Time in 20, in such deplorable Circumstances, it cannot but be a Discovery of the greatest Consequence; especially as we are sufficiently assured beforehand, that all Cordial and Alexipharmic Medicines besides, can be of no Service at all. And this may serve as another Argument, why, under any Probability of a Person's being injured by the *Indian* or *Negro* Poison, this Remedy should be administered; even though we cannot positively be assured, whether it be by this very Poison or not: For in Cases where all other Remedies are likely, if not sure, to prove unavailable, we may as well advise this as any.

One Thing more I must beg leave to add, with regard to the Trial of this Medicine; that it would be necessary to observe, whether the same Root, dried, would be of equal, or any Efficacy; that if so, the Bene-

Benefits of it may be extended to other Climates wherein this Herb does not naturally grow: Particularly as the Author is convinced, that the same Sort of Poison is used both in Spain and Italy.

II. i. Ambergris is called *Ambra Indica*, *Ambra Orientalis*, *Ambra odorifera*, and *Ambra vera*; but most commonly *Ambra grysea*, or *chrysea*. It has also several barbarous Names, as *Porambar*, *Puambar*, and *Pinambar*; also *Ambra rufa*, *pinguis*, *Selachitica*, *Secbra*, and other such like, which I shall pass over in Silence, as conducing little or nothing to my Purpose.

Of Ambergris,
by Caspar Neu-
man, M. D.
Prof. Chym. at
Berlin, F. R. S.
No. 433. P.
344.

There are few Substances concerning the origin of which there have been so many various Opinions among Authors. One ascribes it to the Vegetable Kingdom, another to the Animal, and a third to the Mineral Kingdom. But others not contented with the 3 Kingdoms, into which all natural Bodies are commonly reduced, have thought fit to make it a Subject of an Aëreal Kingdom; and others again will have it to belong to none of these Kingdoms, but to a Marine Kingdom: and yet the whole Sea, with all it's various Contents of Animals, Fishes, Shells, Plants, Stones, Waters, Salts, &c. may be ascribed to one or other of the three usual Kingdoms; and therefore there is no Need of any such new Distribution.

I should be guilty of great Tedioufness and Prolixity, if I should insist upon all that has been said of it by these various Authors: Wherefore I shall touch but lightly upon what appears palpably absurd, and examine only what Opinions seem more probable, and are received by several Persons, giving my own Opinion also concerning them.

As for the Aëreal Kingdom, I know but of one Author, *Oelven*, who has stood up for it; for he has taken Ambergris for a *Meteor*, or Body generated in the Air, and has endeavoured to support this evidently false *Hypothesis* by various Reasons. But as this Opinion is sufficiently confuted by the very Weight, which sometimes amounts to 100 lb, and by the Substance and Mixture of the essential Parts of Ambergris, I shall not dwell any longer upon it, especially as it was confuted also in 1707.

Many stand up for the Animal Kingdom, but so as in some Measure not to forsake the Aëreal; for they will have the origin of Ambergris to proceed from volatile Animals. These differ egregiously one from another, and may be divided into 2 Classes. The first take it to be the *Dung of Birds*, to which Opinion they have been led by the small Bills and Claws, or little Pieces at least of them, which are often found in Ambergris. Nay they go so far as to describe the very Bird from which it proceeds. They say it is of the Size of a Goose, with beautiful Feathers, and Spots, and is called in the *Maldivian* Tongue *Anacangrispasqui*, and in that of *Madagascar* *Afchibobuck*. *Ferdinand Lopez de Castagneda** and others affirm, that this Bird feeds upon various fragrant

* *Rerum à Lusitanis in India Orientali gestar. Script. Lib. iv. Cap. 35.*

Herbs, and that it deposits the precious Dung proceeding from them, on Rocks and Stones in and about the Sea; and that this Excrement is digested and macerated by the Sun, and depurated by the Moon, and so being ripened by the 2 celestial Luminaries into Ambergris, prepared and perfected, it is afterwards torn off by Storms, and washed into the Sea by the Waves, and at last thrown upon the Shore; or else is swallowed by the Whales, which not being able to digest it, soon vomit it up again. The other Class, of which the principal are *Denis**, *Monconys*†, *Lemery*‡, and *Pomet***, to whom most of the *French* Authors adhere, say the Ambergris is the Comb of a Sort of Bees, which build their Cells about the Rocks, whence they are carried away by Storms, and being tossed about by the Waves, are attenuated, torrefied, and digested by the Salt Water and Heat of the Sun, into Ambergris, in which Form it is cast on the Shore. Those, who embrace this Opinion, endeavour to confirm it by that white, viscid, tenacious Substance, which is commonly precipitated from the Essence of Ambergris, and is thought by them to be of the Nature of Wax.

That both these Opinions are false, it is evident from the following Circumstances: 1. There is a sufficient Quantity of Ambergris found in those Places, where none of these Birds or Bees are to be seen. 2. Where there are few or no Rocks or Stones: 3. Where the Stones and Rocks are free from the Dung of Birds, and Cells of Bees.

That the first Opinion in particular is false, is evident, because, 1. Those Parts of Birds which are sometimes found in Ambergris, are not the Bills and Feet of a Goose, but only some light and very tender Particles. 2. It cannot be imagined, how the Bills and Claws and other Parts of different Birds should get into the Body and Dung of the Birds supposed to breed Ambergris, which are said to be of the Size of a Goose. 3. The eating of fragrant Herbs by no Means renders the Dung fragrant. 4. It is contrary to all Experience, to say that the Sun by it's Digestion gives a fragrant Smell to any Excrement; for on the contrary it promotes Putrefaction, which does not produce an agreeable Smell, but a nauseous Stink; especially when many soft Excrements are joined together; as we often find large Masses of Ambergris, that are yet viscid. But if the Excrements are small and dry, the Sun draws out of them all their fragrant Particles, as we see in the Dung of many Birds, which are quite dried up by the Sun, and reduced to an insipid Earth. 5. This Dung of Birds would be dissolved by the Sea Water, or at least reduced into small Pieces, notwithstanding it's having

* Rec. des Memoires & Conferences sur les Arts & les Sciences 1672. M. Aug. Pag. 222, & s. it. Mediseri Cosmograph. Tom. I. p. 101. it. Ejus descriptio Insulae Madagascar, Cap. vi. pag. 43. it. Odoardus Barbosa, it. Andr. Tevet & Franc. Belloforestus.

† Monconys in Itinerario suo Edit. Paris. en Suite de la II. Partie, p. 143. item Edit. Londinens. pag. 71.

‡ Traité Universel des Drogues simples, pag. 34.

** Histoire generale des Drogues, Part. II. Liv. I. pag. 57.

been ever so diligently irradiated by the Beams of the Sun and Moon.

6. The Waves of the Sea cannot be expected to wait till the Dung has been sufficiently digested by the Sun and Moon, but must be frequently washed away in it's more imperfect State, and so be quite dissolved and dispersed in the Water. Whence then do those solid and uniform Pieces of Ambergris arise, which amount sometimes to 100 lb. 7. The Inhabitants, Fishermen, and Mariners employed in getting Ambergris, are wholly unacquainted with these Birds and Excrements. 8. If it follows from the Bones, Beaks, and Claws of Birds being found in Ambergris, that this Substance must be the Dung of Birds; I would ask in the first Place, whether any Person has ever known an Instance of these Parts of Birds being discharged with their Excrements. And if this is affirmed, I may with equal Reason assert, that Ambergris is the Dung of Shell Fishes; for there are as many Fragments of Shells as Parts of Birds found in it. 9. This Opinion is contradicted by the Substance, natural Mixture, and chymical Analysis of Ambergris; for no Sign of an Excrement can be found in it; to pass over other contradicting Circumstances.

The Opinion of the Bee hives may also in like Manner be refuted: For, 1. Such Bees and Bee-hives must have been observed by several Persons; and yet not one, either in *Asia* or *America*, has ever seen them. Therefore this Opinion must rest wholly on the Authority of *Denis* and *Monconys*, and those who implicitly assent to them. 2. If ever so many Hundred Thousand Bee-Hives were really observed to be about the Rocks; yet it is well known, that the Honey would entirely dissolve in the Water, and leave the Comb empty. 3. If these tender Cells were emptied of their Honey, the remaining Mass would not be strong enough to resist the Violence of the Waves, and would be torn in Pieces, far from resembling such a large uniform Mass as Ambergris. 4. If any one should still maintain, that these Cells do resist the Waves, he must allow that we should find a cellular hollow Substance in Ambergris, which we certainly do not. *Borellus* * indeed, who was of this Sect, was of Opinion, that these emptied Cells were afterwards filled in the Sea with various Substances: but this is a meer Fiction, and Imagination of his own. For these waxen Cells must still continue to be Wax, and no one can imagine that they would be filled accidentally in the Sea with Ambergris. If that was the Case, then it would again contradict the Opinion, that Ambergris is produced by the Bees. I should rather think, that if these Cells were tossed about in the Sea, they would be filled with various Substances; and if any one can bring himself to imagine, that the Mixture of various Substances accidentally brought together is Ambergris, he will again contradict the Production of it by the Bees. Besides the Form of the Cells would remain, which no body pretends to have seen. 5. If any one should object, that the Wax is

* Petr. Borell. Obs. Med. Phys. Cent. iv. Obs. 66;

conglobated into one Mass by the Heat of the Sun. I answer, that I find by Experience, that if I expose a Honey-comb to the Sun, and digest it, turn it, or manage it in any Manner whatsoever, this Effect is not produced; and granting that this could be done, yet it would still continue to be Wax, and of an uniform Substance, which Ambergris is not. 6. If we apply Wax to the Flame of a Candle, it will not flame before it melts, which Ambergris does. 7. Wax and Honey retain their own specifical Smell, which is very different from that of Ambergris. 8. This whole Class may be convinced by Chymistry alone; for, in the Examination of Ambergris, there is not the least Trace of Honey or Wax to be discovered: nor can *Lemery* * himself prove from that white and viscid Substance, which is precipitated in the Effence of Ambergris, if he will but carefully examine it, that it is Wax, as he has imagined. *Kaempfer* †, who was in *India* himself, openly contradicts these People, especially if they add this gross Circumstance, that there has some Ambergris been found, in which crude Honey still remained; for he says, “All the modern *French* Writers are “mistaken, who follow *Denis* in this Point.”

I should now consider that other Opinion, which makes Ambergris an animal Substance; but as this relates to marine Animals, which the Authors unnecessarily form into a separate Kingdom; but as I have begun at the Top with the aëreal Opinion, I shall descend gradually, stopping at present upon the Earth, in order to consider those Opinions, which derive the Origin of Amber from the vegetable Kingdom.

Sylvaticus ‡, in the first Place, says that Ambergris is a Gum; which Opinion is easily overthrown by considering the constituent Parts of Ambergris; for it is not even a Gummo-resin, of which at least some Part will dissolve in Water; much less a pure Gum, which ought wholly to dissolve in Water; nay the very reverse of this is true of Ambergris, and therefore there is nothing of a Gum in it.

Others will have Ambergris to be a Resin **, or balsamino-resinous Tear, of a certain Tree, as they pretend, though it is not yet known what Tree it is. These Trees are said to grow near the Sea, and to drop the Resin into the Water, where it is tossed about, impregnated with Salt Water, digested by the Sun, and so becomes Ambergris. But this Opinion appears to be fabulous; for, 1. These Trees must needs grow very close to the Sea, for their Resin to drop into it. 2. They must have very deep Roots, or else they must be frequently subverted by the Washing of the Waves. 3. If the Resin fell Drop by Drop into the Sea, each Drop being surrounded immediately by the

* Loco citat. & in ejus cursu Chemiae.

† Amoenit. exot. p. 632, 633, 634.

‡ In Pandect.

** Alexand. Geraldinus in Itiner. suo ad Pontif. Leon. X. ex Libavio Lib. iv. Singular. C. H. in Scholiis, pag. 320. A. D. Boyle V. Philosoph. Transact. No. 97. pag. 613. & seq. See Vol. II. of this Abridgment, Chap. iii. §. 69. 1.

Water would find it difficult to join with the rest into a Mass. 4. These Trees are wholly unknown to Mariners and Fishers of Ambergris, to Inhabitants and Strangers, as has been observed by *George Eborhard Rumpffius* *, who has sufficiently exploded this Opinion. 5. The contrary Mixture of Ambergris with expressed Oils, and many other Substances, plainly shews it not to be a vegetable Resin.

Averrhoës † says that Ambergris is a Sort of Camphire, and yet he did not know what Camphire itself was: and besides, with regard to Volatility, Solubility, Colour, Smell, and many other Properties, there is as much Difference between Camphire and Ambergris, as between Light and Darkness.

Others again pretend, that Ambergris proceeds from a certain Fruit ‡, which the Whales greedily swallow, and so digest it in their Bodies into Ambergris; but this is a *Chimaera*, which does not deserve an Answer; what remains of it's imaginary Derival from the vegetable Kingdom, relates to the Sea, and has nothing probable in it; but is directly contrary to the Nature and Property of Ambergris.

But to make an End of this Part, I shall now produce the remaining Opinions concerning some *marine Bodies*, as also the rest of the *Vegetable Substances*. *Julius Cesar Scaliger*, and *Serapius*, have taken Ambergris for a Sort of *Fungus* **, and have said, that it grows at the Bottom of the Sea, from whence being broken loose, it is afterwards thrown on the Shore. But this Opinion confutes itself, because there is no Sort of *Fungus* in the whole World, that has not it's own certain characteristic Figure, which by no Means agrees with Ambergris.

Libavius †† and *Weckerus* ‡‡ will have Ambergris to be the Froth of the Sea, but, to omit any stronger Objections, it is sufficient to observe, that in very many of those Places, where the Sea most works and froths, there is no Ambergris found, though, according to this Hypothesis, there ought to be the greatest Quantity.

Cardan *† takes Ambergris to be *Sperma Ceti*; but how different that is from Ambergris, is too obvious, to need any Argument.

Eichstadius †† and *Fragosus* ‡† relate, that Ambergris is the Liver of a certain Fish; but every one knows that a Liver has it's *Parenchyma* or *Capsula*, and consists of Filaments of Veins and Arteries, not to mention that a Liver, by Distillation, yields very different Parts from those that are obtained from Ambergris.

* Valentini Ost-Indische Sendschreiben sub No. xi. pag. 56.

† In Colliget. Cap. 56.

‡ Nic. Monard. de Simplicibus Medicam. Edit. Plantin. Antv. pag. 13.

** Justi Fidi Klobii Ambrae Historiae, pag. 18.

†† Lib. iv. Singularium, Cap. i.

‡‡ Weckerus in Speciali Libr. Sect. ii. p. 79. item Sylvaticus, in Pandect.

*† De Subtilitat. pag. 284.

†† In Lib. de Confect. Alkerm. Cap. xii.

‡† In Lib. de Medicam. ex India in Europ. delatis. Cap. de Ambaro, p. 89.

Many adhering to what they call the marine Kingdom, are of Opinion that Ambergris proceeds from *Fishes*; but then they differ so much in their particular Sentiments, that we may divide them into 3 general Classes. The first say, it is absolutely generated in *Fishes*; the second, with more Reason, that it floats in the Sea, and is swallowed by *Fishes*: the third determine nothing positively, observing a Sort of Neutrality, and only say it is found in *Fishes*, without declaring whether it is generated in them, or swallowed by them. From these 3 principal Opinions many Subdivisions have arisen, both with regard to *Fishes*, and to their Deglutition and Generation of it. With regard to *Fishes*, some say it is found only in the greater, others in the smaller also. Some say it is found in all Sorts of Whales, others only in one Species; though these again differ in the Denomination of this Species. With regard to their swallowing of it they differ also; for some say it is greedily swallowed by all *Fishes*, others only by one Species. Some say the *Fishes* are killed by it, others that it does them no Injury at all. Some say they vomit it up, others that they discharge it downwards. Others again contend, that Ambergris is swallowed not only by *Fishes*, but by other Animals also. Nor are the Opinions less various with regard to the Generation of it.

Gabriel Nakke and many others confirm what the celebrated *Rumpfius* * writes from *Amboina* to *Ten Rhyne*, that not only the greater Whales, but also the smaller *Fishes*, and even *Birds* and *Boars* (some mention *Foxes* too) greedily swallow Pieces of Ambergris, which they vomit up again. Hence says he arise so many various Opinions, not only among the common People, but also among many Authors, whilst some ascribe it to Whales, and others to Hogs, and both Parties imagine it to be generated in these Animals; whereas it is found in them only by Accident.

Of those who entertain the Opinion, that Ambergris is found only in one Sort of Fish, a certain Species of Whale, some call this Fish *Azel* †, affirming at the same Time, that this Fish greedily swallows it, and dying soon after, is sought after by the Fishermen with great Industry. Others call this Fish *Mokos* ‡, saying it is above 20 or 30 Feet in Length, that it lives in the *East-Indies*, and is taken about *Japan*. *Andreas Cleyer* called this Fish *Cetus Ambrophagus*, or the Amber-eating Whale, and sent a Draught of it to *Mentzelius* at *Berlin*. Others say it is a certain Sort of Whale belonging to the Genus of *Lamiae* **. Others again, among whom is Mr *Paul Dudley*, who resided in *America*, think that Ambergris is afforded only by that Sort of Whale, which is called the *Sperma Ceti Whale*.

* Loco citat. Valentini sub No. viii. pag. 50.

† Gefner. de Aquatil. & quidem de Cetis diversis Lib. iv. pag. 204.

‡ Kaempferi Amoenitati exot. Fascicul. 3. pag. 635.

** Valentini Ost-Indische Sendschreiben, pag. 50.

Many side with neither of these Parties, and say that Ambergris is not found in any particular Fish, but in all the larger Fishes in general; and do not decide the Controversy, whether it is swallowed by them, or generated in them. They differ only in this, that they do not assign the same Place in the Fish for the Ambergris: for many affirm that it is contained in the *Stomach* of the Whales, and others will have it to be in the *Intestines*. Hence have arisen two Opinions, one that they vomit up, and the other that they discharge it downwards. But all these Opinions tend to one and the same Conclusion; that Ambergris is not generated in these Animals, but swallowed by them. For it is self-evident, that whatsoever is ejected, either upwards or downwards, must necessarily have been in the *Stomach* before; and whatsoever is thrown up must necessarily proceed from the *Stomach*; and therefore the Ambergris that is in the *Stomach*, if it is not vomited up, will naturally be thrown down into the *Intestines*; so that it's being ejected upwards or downwards constitutes no real Difference. It is well known, that there is nothing naturally in the *Stomach* but Juices; and that all the solid Contents of it must have been taken in by the Mouth. If therefore Ambergris is really found in the *Stomach* or *Intestines* of the Whale, how can any Man of Judgment imagine that it is generated there? Therefore those eminent Authors, who think, that Ambergris is vomited up by the Whale, or discharged by the *Anus*, or found in the *Stomach*, or in the *Intestines*, all concur in this certain and undoubted Truth, that it is swallowed down by these Animals, and not generated in them. Hence however many have imagined, and especially the Inhabitants of *Madagascar*, with most Fishermen and Mariners, that Ambergris is nothing but the *Excrement* of the Animal. In *Japan* also, they call the Ambergris which is either found in the Body of the Whales, or ejected by them, in their Language *Kusura no fuu*, which is said to express the Dung of Whales*.

Job. Matth. Faber says, if the Whale swallows Ambergris and discharges it again, the Vulgar may be allowed to call it the Excrement or Dung of a Whale; but Men of Judgment cannot allow it to be really so. Give me leave to illustrate this by an Example. Crude Quicksilver, or the Globules of *Regulus* of Antimony, otherwise called the perpetual Pills, are swallowed by one Person and voided again; and when they have been well washed are given to another, and so on to 10, 20, or more different Persons successively; as I have seen it done with Quicksilver in the *Iliac Passion*. Now if this Quicksilver or Antimony is voided by a living Person, or found in his Body after Death, in the true Form of Quicksilver or Antimony, would any one account these to be animal Substances, because they are found in a human Body? or would any take these metallic Substances to be human Dung, or call them human Excrements, because a Man has voided them by Stool?

* Kaempf. Loco citat. pag. 635.

Surely the most ignorant would laugh at him, even though he should affirm, that these Substances had been swallowed down by 100 Persons successively, and voided again after having staid ever so long in their Bodies.

It is just the same Case with the swallowing and voiding of Ambergris: it is not indeed such a metallic Substance as *Regulus* of Antimony or Quicksilver; but however it is a Mineral, as we shall see in it's proper Place. I shall add a few Words about it at present. Ambergris is an extraneous Substance, that swims in the Sea, and is swallowed as a Delicacy by the Fishes, and voided by them again undigested. It seldom stays long enough, to be found in their Bodies. *Monardes* tells us, that in his Time 100 lb. Weight of Ambergris was found in the Intestines of a Whale near the *Canary* Islands; and adds, that a great Number of them was afterwards killed, and none found in any of them. Many hundreds of Whales may be killed without finding any in them; and if any does happen to be found, it must be, because the Compactness or Bulk of the Mass, or perhaps some Disease, has obstructed it's Passage through the Intestines.

It therefore is an indubitable Truth, that Ambergris is swallowed by various Fishes, especially Whales; that it is afterwards voided by them; that it sometimes stops in their Stomachs or Intestines; all which Circumstances have been confirmed by the joint Testimony of several credible Persons. But we must not therefore conclude, that it is generated in these Animals; or that, because it has staid some time in their Bodies, it is to be accounted an animal Substance.

The last Opinion which I shall here mention is, that Ambergris is an *Animal Recrement*, or singular Substance generated in the Whale, as Castor, Civet, Musk, Bezoar, &c. are in the particular Animals which produce them. This Opinion has had, and still has, it's Favourers; and has been lately published to the World, as a new, certain, and true Discovery, in two Accounts sent a few Years ago from *America* to the Royal Society.

2. It is still fresh in the Memory of the Royal Society, that two singular Accounts of this Subject have been sent from *America*, one by Dr *Boylston**, and the other by Mr *Dudley*†, both asserting and defending the above-mentioned Opinion. I have the greatest Regard for the sincere Intention and Labour of these worthy Gentlemen: but I have some Doubt with Regard to their Accounts, so far as they assert that *Ambergris* is a true animal Substance, or generated in the Whale.

I shall not repeat what they have said at full Length, but only the principal Members of their Accounts, with some Circumstances; and chiefly what Mr *Dudley* has said in the following Words:

1. Ambergris is found only in the *Sperma Ceti* Whales.

* See Vol. VII. Part iii. Chap. i. §. xi. 1.

† Ibid. Art. 2.

The same continued, Part ii.
No. 434. P.
371. Sept.
&c. 1734.

2. It consists of Balls, or globular Bodies, of various Sizes, from about 3 Inches to 12 Inches Diameter, and will weigh from $1\frac{1}{2}$ lb to 22 lb.

3. They lie loose in a large oval Bag or Bladder, of 3 or 4 Foot long, and 2 or 3 Foot deep and wide, almost in the Form of an Ox's Bladder, only the Ends more acute, or like a Blacksmith's long Bellows.

4. They have a Spout running tapering into, and through the Length of the Penis.

5. They have a Duct, or Canal, opening into the other End of the Bag; and

6. Coming from towards the Kidnies.

7. This Bag lies just over the Testicles, which are above a Foot long, and is placed lengthways at the Root of the Penis, about 4 or 5 Foot below the Navel, and 3 or 4 Foot above the Anus.

8. It is almost full of a deep Orange-coloured Liquor, not quite so thick as Oil, and smelling strong, or rather stronger, of the same Scent with the Balls of Ambergris, which float and swim loose in it.

9. The Inside of the Bag is very deeply tinged with the same Colour as the Liquor, which may also be found in the Canal of the Penis.

10. The Balls seem to be pretty hard, while the Whale is alive, in as much as they are many Times found upon opening the Bag

11. Large concave Shells of the same Substance and Consistence, that have scaled off from them.

12. And the Balls themselves seem to be composed of several distinct Coats inclosing one another, something like the Coats of an Onion.

13. As to the Number of Balls, he was told by Mr Atkins, that he never found above 4 in a Bag, and in the Bag, where he found one that weighed 21 lb, which was the largest he ever saw, there was no other. He further says, that

14. The Whale-men have observed, that the Ambergris was found only in such Whales, as are old and well grown, and of the Male Sex. But as to this Particular Mr Atkins says,

15. He never saw nor certainly heard of a *Sperma Ceti* Female taken in his Life: the Cows of that Species of Whales being much more timorous than the Males; and almost impossible to be come at, unless when haply found asleep on the Water, or detained by their Calves. This he affirms for a Certainty, that the Boats can never come near them when they are awake, they are so very shy and fearful. Mr Atkins further says,

16. That to 1 *Sperma Ceti* Whale, that has any of these Balls, there are 2 that have nothing but the deep Orange-coloured Liquor aforesaid in their Bags. In the last Place

17. Mr Dudley boasts, that Truth is the Daughter of Time, and that it is now at length found out, that this *Occultum Naturæ* is an animal Production, and bred in the Body of the *Sperma Ceta* Whale, analogous to what is found in some Animals of the Land, as the Musk-Hog,

Ec. and towards the End of his Account he says, I hope the Society will accept of this first Essay, and allow my poor Country the Honour of discovering, or at least ascertaining the Origin and Nature of Ambergris; however

18. He confesses just before, that as for his own Part, he dares not pretend to give any Opinion upon the Point, but contents himself with relating Matter of Fact: Which Relation however

19. I have chiefly taken from Mr *Atkins*, who used the Whale-Fishery for 10 or 12 Years together, and from several other famous Whalemen, who lived in those Parts.

As for Dr *Boylston's* Account, the Sum of it consists in the following Articles.

(a) That Ambergris is found in no other Species of Whale, than that which yields the *Sperma Ceti*, and only in the Male of that Species; and that in one it was found to the Weight of 20 lb. *more or less*.

(b) That it is found scarcely in *one of a hundred* of them.

(c) That it is contained in a Cyft or Bag.

(d) That this Bag is sometimes found empty, and yet entire.

(e) That this Bag is no where to be found, but near the *genital Parts* of the Fish.

(f) That the Ambergris is, when first taken out, moist, and of an exceeding strong and offensive Smell.

(g) But whether or not the Ambergris be naturally or accidentally produced in that Fish, he leaves to the Learned to determine; and

(h) Lastly, that his Account is taken only *from the Whale Fishermen*.

It appears therefore from these Quotations,

1. That the two Accounts agree in some Parts.

2. That they differ in some Parts; which Difference however does not contradict the principal Question.

Both of them agree in these Particulars: 1. That the Ambergris is found only in the Male *Sperma Ceti* Whales; 2. That it is found in a *Cyst or Bag*; 3. That Pieces are found weighing 20, 21, or 22 lb. 4. That this Cyst is situated *very near the genital Parts of the Fish*: 5. That the Ambergris, when first taken out, is moist, and of a *very penetrating, but strong and offensive Smell*. 6. That they had these their Accounts and new Discoveries from the *Whale Fishermen*.

But they differ in the following Circumstances: 1. Mr *Dudley* relates, that this Bag or Cyst has a Duct or Canal at each Extremity, one proceeding from the Kidnies in the upper Part of the Bag, and the other in the lower Part, passing into and through the *Penis*: on the contrary, Dr *Boylston* says this Cyst has neither Inlet nor Outlet. 2. Mr *Dudley* relates, that though some Fishes have no Ambergris in them, yet that Liquor is always found in them, which we mentioned under No. 8. But Dr *Boylston* affirms, that this Bag is sometimes found quite empty: 3. Mr *Dudley* relates, that if they found Ambergris in one Fish, they found

found two without any : but Dr *Boylston* says, that in 100 *Whales* there is hardly one found that contains any *Ambergris*.

However these 3 Differences may easily be reconciled. As for the first, where Dr *Boylston* relates, that the Bag has neither Inlet nor Outlet, that may arise only from the Negligence of the Fisherman, who gave him the Account, and did not observe every Thing so accurately as Mr *Atkins's* Fisherman did ; for how could the Bag be found sometimes full and sometimes empty, if it had neither Inlet nor Outlet ? For the second, that the Bag is sometimes found empty, this may be meant either of the Balls or of the Liquor, and indeed it does not absolutely contradict Mr *Dudley's* Account, whilst both may be natural, or happen so at that Time. Lastly, the 3d Difference makes no Difficulty ; but both Accounts agree that *Ambergris* is found only in some Male Whales, and not in all ; and I imagine, that each of them set down only a certain Number for an uncertain one.

Having now examined both these Accounts, I shall venture to affirm, that the Substance, which they have taken for *Ambergris*, is not really so, but quite of another Nature. I entirely agree with Mr *Prince's* Opinion, as all Men of Judgment will do, who have only a general Conception of the principal Parts of Anatomy, or only know where and how the principal Parts are situated in large Animals. This Opinion is related in Mr *Dudley's* Account, in the following Words : “ The Reverend Mr *Prince* of *Boston*, a very worthy Divine, and one of my intimate Acquaintance, in a neighbouring Town, who took the preceding Relation from Mr *Atkins*, apprehends the Bag aforesaid to be the *urinary Bladder*, and the *Ambergris* Ball to be a certain *Concretion*, formed out of the greasy odoriferous Substance of the Liquor aforesaid contained within it.” For my own Part I declare, that, 1. The Bag in Question is nothing else than the *urinary Bladder* of the Whale ; 2. That the imaginary *Ambergris* found in it is nothing else than a *Calculus* of the *Bladder* ; and, 3. That this penetrating odoriferous Liquor in the Bag is nothing else than the *Urine* of the Whale. Do but consider the preceding Extracts, where, under No. 3. it is said that this Bag or Bladder is 3 or 4 Foot long, and 2 or 3 Foot wide ; that it is almost in the Form of an *Ox's Bladder*, or like a Blacksmith's long Bellows ; is not this a Description of an urinary Bladder ? especially as under No. 4, 5, 6, 7, all the other Requisites, and the proper Situation of it are proluxly described, how it is connected with the *Penis* and Kidnies, being placed under the Navel, above the Testicles, at the Root of the *Penis* ; moreover, under No. 8. how it is almost full of a penetrating and strong smelling Liquor, which is usually found in this Bladder, though none of the imaginary *Ambergris* is there ; can this Liquor be any thing else than the *Urine* of the Whale ? And granting what I have extracted from Dr *Boylston* under (d), that the Bladder is sometimes found empty (though he does not explain himself clearly on this Article, but I rather believe, that by the Word empty he does not mean empty of

of Urine, but only of *Calculi*) it is nothing impossible or unnatural, for it may sometimes happen, that the Whale may have voided his Urine just at the Time of being killed. The Urine is farther confirmed under No. 9. where it is affirmed, that the same Liquor (namely the Urine) is found (as all Urine is) in the Canal of the *Penis*, or *Urethra* of the Whale. Who now can question but that the Balls lately found, and taken for Ambergris, are mere *Calculi* of the Bladder of the Whale? Let us consider a little more attentively what I have extracted under No. 10, 11, 12, 13, and 14, and consider that these Balls are of the same Smell with the Liquor, and (as Mr *Prince* says) of the fat Substance of the Liquor; also what Dr *Boylston* relates under (f), that they are of an exceeding strong and offensive Smell; also their being formed of distinct Coats and *Strata*, after the Manner of Onions, where they grow, are generated, and hardened one above another; and that, according to this Situation, they are easily decorticated and pulled asunder: I ask, whether all these are not natural and common Circumstances to all *Calculi*, or Stones, found in the Gall or urinary Bladder, or in other Parts of Animals? Why then should such a *Calculus* be taken for Ambergris? the urinary Bladder for a particular Cyft? and the Urine for a particular Liquor? This is further confirmed under No. 14. where we read, that the Whale-men have observed, that the Ambergris (I call it *Calculus*) is found only in such Whales as are *old* and well-grown. Secondly, by what is quoted under (b) from Dr *Boylston*, that *scarcely in one of a hundred of them* has any Ambergris in it (or rather is troubled with the Stone;) these 2 Circumstances also are quite natural, and common both to Men and Beasts: 1. That the old are sooner infested with the Stone than the young; 2. That as not all Men, but scarcely one in a hundred has the Stone, this may be quite natural also in irrational Animals. Besides, this agrees with other animal Concretions, that 2, 3, 4, or more, are often found in the Bladder, which may easily obtain a round Figure from their continual Agitation in the Urine; though I have observed, that the Figure of *Calculi*, and also of Bezoar Stones, generally arises from a *Nucleus*, which is covered by the first Coat or Crust, that assumes the Form of the contained *Nucleus*, whether round, oblong, or angular. At other times the Figure of the *Calculi* arises from a greater or less Space and Motion: for if they are so many in Number, as not easily to move about in the Bladder, then they seldom are round, but for the most Part uneven and irregular: so likewise they often split into Scales, if there are many of them, and if any Collisions of the Stones happen in the Bladder from the Motion of the Animal. Nor in the last Place does this Circumstance cause any Doubt in me, when they relate, that *only the Male Whales* contain these Balls, because it may be, that only the Males are afflicted with that Disease, or that we have not yet sufficient Experience with Regard to the Females, because (No. 15.) *it is almost impossible to come at the Cows of that Species of Whales*, and consequently very few of these Females, nay very rarely

rarely any of them are taken; and because, among the Male Whales, according to the above quoted Observation of Dr *Boylston*, there is hardly one in a hundred that is found to labour under this Distemper.

That very Circumstance produced by both these Gentlemen, that this Substance is *not found in every Male Whale*, but scarcely in one of 100, and only in those that are *old* and full-grown, makes evidently against them, and shews that it is not such an animal Recrement as Musk, Castor, &c. and confirms my Opinion, that it is nothing but a *Calculus*.

If their imaginary Ambergris was a *Recrement of Nature*, if those strong smelling Balls were any thing innate in the Male Whales, if that Bladder was a particular Cyst, and not the urinary Bladder, and the Substance found in it any thing natural, like the Musk, Civet, and Castor, in their particular Animals; to which Mr *Dudley* endeavours to compare this morbid calculous Concretion, then *this Substance would be in all the Sperma Ceti Whales, as Castor is found in all Beavers, Musk in all Musk Animals, and Civet in all Civet Cats*; nor would it then be found in the urinary Bladder, and *all absolutely* (not one in a hundred, or only the old ones) would *always and inevitably have* such Balls.

If that Substance was innate in these Fishes, and natural in a healthy State, like Castor, Musk, Civet, and such like, then not only the *Sperma Ceti Whales* in *America* would afford it, but those also which are taken in *Europe*, in the *Spanish, French, and British Seas*, especially in the Northern Ocean, but no one has ever seen any in those Countries.

Mr *Dudley* says, in his Account, that the greatest Ball of Ambergris, which he ever saw, weighed 21 or 22 lb. which, considering the Size of the urinary Bladder, is *a pretty large Calculus*. But I would ask whence those great Masses come, which are not round, or of any certain Shape, are of the Size of 6 Feet, and weigh 182 lb. or more, which are not coated like an Onion, incruited, crumbly, or of an Orange Colour, much less of a strong or offensive Smell; but are not offensive, are irregular, compact, grey, whitish, and of a sweet Smell? *Whence, I say, do these Masses proceed, which are ten, nay twenty, times as big as the Pieces mentioned by them, and are too big to be contained in the Cyst of the oldest and largest Whales?*

I ask further, how this Ambergris can be thrown upon the Shore or on the Land? That it should proceed from the living Animal, is impossible, because the Cyst has its Outlet only through the *Penis*, and therefore only small Pieces can pass through that Canal. If any one would contend, that such Pieces come from dead Whales, I could easily reply; how then do they get out of the Bladder? especially as such Bladders are membranous, and of a very tenacious Texture, so that one might reasonably suspect, that the Bladder could not burst so easily after Death, or give a free Exit to these Balls. I imagine, that the Ambergris would sometimes, if not often, be found swimming with the Bladder, which no one has ever seen or heard of.

How

How can the Bills and Claws of Birds, Shells, Fish-bones, and other extraneous Bodies, which are sometimes found in Ambergris, pass through the Kidnies and Ureters into the urinary Bladder, or rather into the imaginary Cyst of Ambergris?

Lastly, to pass over other Arguments, I shall produce only one, my *primary*, and indisputable, *regulating*, *chymico-physical* Argument, which ought to be looked upon as decisive in the present Question, as in all other natural Subjects, and never has deceived, or can deceive, if it is but attended to with due Circumspection.

It is well known, that not only Castor, Musk, and Civet, but that *all Animals*, and *all Parts of Animals* whatsoever, by *chymical Trial*, especially by an open Fire or Distillation per se, yield either an *empyreumatico-urinous Spirit*, or a Phlegm of the same Sort, or a *fetid animal Oil*, or therewith an *urinous volatile Salt*, and either all these together, or 1, or 2 of them, or at least some Sign of an urinous Liquor, or *empyreumatic animal Oil*. I do affirm, that *all animal Substances must necessarily discover some of these*, and strike the Smell and Taste, when they are tried by the Fire, which is true even of the fossil Shells; for by this Proof they reveal their animal Origin. And thus also the *imaginary Balls of Ambergris* will plainly and sufficiently demonstrate by this Proof, that they are not only a mere animal Production, but also of a *mere urinous Origin*, being generated from the Urine of the Whale. But on the contrary, if any one tries in like manner, by Distillation with an open Fire, the true Ambergris, purified from all visible animal Parts, that has not been formerly swallowed by any Animal, but perfectly pure, and examines what is obtained from it, he will not find the least of any thing urinous, or of any *empyreumatic animal Oil*, or of any thing animal, but every thing quite different, and otherwise modified, another Liquor, another Oil, and something of another Salt, as I shall hereafter demonstrate.

This therefore may be taken as an infallible Sign and undoubted Truth: If in the analysing of Ambergris, there appears ever so little of animal Substance, whether oleose, or urinofo-saline, then *this does not proceed from Ambergris, as pure Ambergris, but from some other animal Substance, accidentally mixt with it, which must be considered as something foreign, impure, and not belonging to the Composition of Ambergris*; whether it had formerly been swallowed, or, if not swallowed, had Bills of Birds, or other small Parts of Animals mixt with it.

But that Ambergris, which has been swallowed by Fishes or other Animals, has received some Sort of Alteration, at least some *animal Taint*, can hardly be denied, whether it has been ejected either upwards or downwards, or found in their dead Bodies. It is sufficient, that it has been in some Manner *infected* by animal Juices and Food, or at least corrupted by being swallowed together with putrid Food, almost digested into Excrement, and consequently made worse rather than better. Hence it generally has a worse Smell, and is more black; nay even

even Experience teaches the Inhabitants themselves to know such Ambergris as has already been swallowed, merely by it's outside appearance, and in some places, as I mentioned before, they even call it the Dung or Excrement of the Whale.

Besides since both the above-mentioned Accounts, sent from *America*, are taken chiefly from the same sort of Persons, *such whose Employment lies in the Whale-Fishery*, and indeed partly from one having heard another say; they are so much the farther from deserving to be esteemed as undoubtedly true, or new, with regard to the true Origin and Essence of Ambergris.

Therefore I leave this Opinion, and turn my self now to the last Class, of those who take Ambergris to be a mineral Substance, or place it's Origin in the Mineral Kingdom.

Hugo de Lindschott pretends that Ambergris is an *Earth**, but if he understood this in a larger Sense, and had recourse to the first original physical Principles, then this Opinion might be allowed. But as he has not sufficiently explained himself by this, much less declared it to be more than a *simple* terreous Mixture, and as it is probable, that *Lindschott* did not mean that Denomination in any such physical Sense; but took Ambergris for a *mere terreous Substance*, I cannot but pronounce this Denomination and Opinion to be erroneous, contrary to Nature, Experience, and the known Property of Ambergris; for it is well known, that *Earths are not easily inflamed or readily melted, or dissolved by Spirit of Wine*; to pass over many other Properties of Ambergris.

Others have in some measure attended to the *Liquability* and *Inflammability* of Ambergris, as *Crato*† and many more, who take it for a *native and true Sulphur*. Dr *Salmon* says it is a marine Sulphur‡. This Denomination is indeed excusable, considering that Ambergris partakes of an inflammable, or sulphureous Principle. For not only the Ancients, but very many Moderns also, give the name of Sulphur to every inflammable Substance, whether Mineral, Vegetable, or Animal, to Oil, Fat, Resin, Wax, Pitch, Balsam, Wood, Suet, Coal, Bitumen, Spirit of Wine, &c. But as this general Denomination expresses *nothing specific*, but only gives occasion to various Imaginations, and as at the same Time it plainly appears, that those very Persons, who take Ambergris to be a native and true Sulphur, have not the least Regard to the inflammable Principle in both, but have taken Ambergris for a *common, natural, perfect, and true Sulphur*, otherwise they would not have called it in express Words a native and true Sulphur, but only a sulphureous Body or Substance. But as it is notorious, that Ambergris is not true Sulphur, this Opinion can be esteemed only false and erroneous.

1. Let Ambergris be thrown on burning Coals, and let it be tried,

* Vide *Klobii Ambræ Historia*, p. 19. column. 1093.

† In *Consiliis à Laur. Scholtzio Collect.*

‡ *London Dispensatory*, p. 398. Edit. Lond. 1696. 8vo.

whether the *Smell* of it agrees with the *Smell* of Sulphur. 2. Let Ambergris be tried with a fixt alkaline Salt, whether it will afford *Hepar Sulphuris*, *Tartarum Vitriolatum* &c. 3. Whether Ambergris will reduce *Regulus* of Antimony again into *crude Antimony*. 4. Whether Ambergris being dissolved in Lime-water, or an alkaline *Lixivium*, will become *Lac Sulphuris*. 5. Whether Ambergris and Quicksilver will produce Cinnabar; and whether many other Preparations, which are made with true Sulphur, can be made also with Ambergris. All these Trials will prove fruitless, as *Libavius* has already objected to *Crato*.

Those come nearer the Truth, who take Ambergris not only for a *Mineral*, but for such a Mineral as it really is, a BITUMEN, or sort of Bitumen; but these have not been able to agree in some Circumstances: For

Some say that Ambergris is produced in a *liquid Form*; others in a *dry Form*; and others will have it to be in a viscid Form, or of a middle Consistence.

They differ also in this; that some affirm it comes from under the Earth on the *Shoar*, and is carried into the Sea; and others endeavour to prove, that it comes from the *Abyss*, or rather from under the Earth of the bottom of the Sea into the Sea.

Those who are of Opinion that Ambergris is liquid at first, or that it comes into the Sea in a *liquid Form*, say it is in it's own Nature at first a *liquid Bitumen*, or Species of *Naphtha*, and among these are *Ebusina*, *Simeon Setbi*, *Navius*, *Avicenna*, *Agricola*, *Solenander*, *Bertinus*, *Libavius*, *Gracias ab Horto*, *Hadrianus Toll*, *Jo. Eusebius Nurenbergius*, *Franciscus Hernandez*, and many others, who all agree that Ambergris comes into the Sea from the flowing of a bituminous Spring, or of a Spring of *Naphtha*, and differ only in some Circumstances; for Instance, *Avicenna* and *Psellus* will have it to flow into the Sea together with the Waters, from lateral Springs; others, on the contrary, among whom is *Nicolas Cbevalier**, who in 1700 described the great *Amsterdam Piece* of Ambergris, affirms, that it rises by itself from the *Bottom of the Sea*, and is as it were distilled by the central Fire from *Kircher's Hydrophylacia*.

Others, who entertain the Opinion, that Ambergris comes into the Sea in a *dry Form*, say it is a sort of Amber, or dry Bitumen, which is carried also into the Sea in the same manner as the common or yellow Amber. *Caesalpinus* indeed calls it a Gem, but at the same time places it under the Species of Amber. *Oelvan*, who took Ambergris for a Meteor, says however, in a certain place of his Treatise†, that Amber bears a great Affinity with Ambergris, but that there is this Difference, that Ambergris is found in the hot Countries, where all Flowers and Spices acquire the utmost Perfection of their kind, and the most fragrant

* *Description de la Piece d'Ambregrise*, pag. 54, &c.
 † *Der Monatlichen curiösen Natur-Kunst-Staats und Sitten Præsenten*, Zweijtes Stück im Februar. 1708. pag. 56.

Smell; but Amber only in the cold Northern Regions, and in the *Baltick* Sea, and is therefore of a more thick and hard Substance. Lastly, the most experienced and learned *Henckelius* * says, that Ambergris, Amber, and Asphaltus, or oriental Amber, common Amber, and black Amber, do not differ in essential Principles, but only in *some Accidents and Degrees*, which last Opinion greatly agrees also with Experience.

In the last place they, who think that Ambergris comes into the Sea in a viscid Form of a middle Consistence, say it is at first like soft Pitch or Cow-dung at the Bottom of the Sea, and hardens gradually. *Helbigius* affirms, that Ambergris is neither a Gum nor a Resin, nor the Dung of Birds, nor the Comb of Bees, but a true *Viscus*, lying at the Bottom of the Sea like Pitch, and growing in a manner like a marine Pitch, as he had been informed by a Merchant from *Batavia*, who had seen it with his own Eyes †. *Rumphius*, in his Letters to *Ten Rhyne*, says it is certainly a Fat, coming from the Bottom of the Sea, soft at first and viscid, but afterwards hardened by the Saltness of the Sea ‥. *Aldrovandus* **, after producing various Opinions, at last concludes in these Words: But we judge these Distinctions to be of no Value, for we affirm it not to be the Excrement of Fishes or Whales, but a kind of *Bitumen*.

Borelli †† indeed endeavours to form an Objection against Ambergris being a Bitumen; saying that Bitumens *stink, and are unfit for internal Uses*. But in such cases we cannot always conclude from the Genus to the Species, or from the Species to the Genus: For even common Amber shews *Borelli's* Objection to be insufficient; for all acknowledge it to be a Bitumen, and yet *it does not stink*, and is frequently and securely given inwardly; not to mention several Springs, which afford a most fragrant Bitumen.

Nicolaus Monardes ‥ says, there are various Opinions about the Origin of Ambergris, but the most true is, that it is a kind of Bitumen, flowing from a Spring, and hardening as soon as it comes to the Air, just as Coral and other submarine Substances are soft under Water.

Jo. Fabio Lyncaeus * says, this is most certain, that Ambergris is nothing but a *Bitumen*.

But, to sum up briefly what has been said, most Writers of Natural History agree in this: 1. That there are both solid and liquid Bitumens: 2. That all Bitumens are to be referred to Minerals: 3. That dry Bitumens are nothing else, than a tenacious inflammable Fat of the Earth: 4. That Ambergris being indued with the same Properties; is consequently, and without any Contradiction, not only a Mineral, but also in Genus and Species a Bitumen.

* See *Bethesda portuosa*, pag. 74.
pag. 459.

† *Valentini Oost-Indische Send-Schreiben*, pag. 50.
Metallis, Lib. III. pag. 432.
Simpl. Medicam. pag. 12.

‡ *Ephem. Nat. Cur. Decur. 1. Ann. IX. ex. x.*

‡ *Loco citat. Observationum.*

* *Jo. Fab. Lyncaei Exposit. in Rech.* pag. 565.

** *Mus.*

‡ *De*

Therefore altho' with regard to the original Consistence of Ambergris, whilst one affirms that it comes into the Sea in a solid Form, another under a viscid and tenacious Form, and a third under a liquid Form, more might still be added, yet I do not see, that this is very necessary, since *these 3 Opinions, as being the chief of all that have hitherto been proposed,* may easily be reconciled, and in such a manner combined, that in some respect all 3 may think right.

No one perhaps, who knows any thing really of the Origin of many subterraneous Bodies, will deny, that all Bitumens were *liquid* at first, tho' they have not come in a liquid Form into the Sea.

Both Ambergris and yellow Amber must necessarily have been at first, *if not quite liquid,* yet for some Time in a *viscid* Form; or Ambergris, when thrown upon the Shoar, must at least have been of such a Texture, that if perhaps it had been hardened in the Sea, it might easily be softened in the Sun: For otherwise neither the little Bills of Birds, Shells, and little Fragments of Shells, nor other small Bodies, could have been found in it; as many sorts of Insects and other extraneous Bodies are well known to be found in yellow Amber.

Lastly, that Ambergris in a *dry Form,* tho' it seems to be an impure and softer sort of Amber, yet appears to be a true *Bitumen,* is plain to every one.

On this occasion, it will not be amiss to observe the Words of *Hernandez,* who says, that Ambergris comes from some Springs of *Naphtha* into the Sea, and is cast on the Shoar by Storms, being a *most odorous, inflammable, or ardent Substance, sometimes harder and sometimes softer, sometimes friable, and sometimes tenacious,* so that it may be bent between the Fingers and Teeth in a manner like Wax.

After all that has been said, it is my Opinion,

1. That Ambergris, in like manner as yellow Amber, comes out of the Earth into the Sea.
2. That it comes into the Sea, not like *Naphtha* or *Petroleum,* but in a thicker, flexible, and probably viscid and tenacious Consistence.
3. That in the first Concretion or Formation of Ambergris, a liquid Bitumen, or sort of *Naphtha,* concurs and is mixed with it.
4. That great Pieces may be generated indeed at the same Time, but that for the most part, a small matter only rises at first; to which another grows afterwards like a *Stratum,* and so more afterwards, forming very irregular Figures, under which Formation it is always somewhat soft, so that various Substances may stick to it, and that it hardens from time to time, till it acquires the Consistence of Wax.

And as Ambergris generally appears under the Form of *Strata,* or Coats, this Circumstance perhaps has misled the Inhabitants of *America,* to imagine that it is generated after the manner of a *Calculus* or Bezoar; when they might have considered, that divers other subterraneous Bodies, both bituminous, as Pit-Coals, Alum, and other Minerals, as

Tale,

Talc, Slate, Ifinglass, &c. are found in *Strata*, under the same Figure with animal *Calculi*.

However I do not think it necessary, to search with over much Exactness into it's *primordial Generation*. For who can explain with Certainty in what manner common Amber is produced, which is a much less precious Substance, and found in greater Quantity. How are Metals, Semimetals, precious Stones, Spars, and innumerable other mineral Substances generated? We know very little with Certainty, in what manner many other subterraneous Compounds are formed, making only Conjectures about them, tho' we may inform ourselves about many of them what they are. This may best be done by Chymistry, which gives the truest Light into all Controversies of this Kind, and that with so much Certainty, that it will not admit of any Contradiction.

To conclude, I cannot help wondering, that *Paul Herman*, who was well versed in the *Materia Medica*, did not so much as mention Ambergris in his *Cynosura*; tho' indeed it was better to be quite silent about it, than to propose any thing so ridiculous as *Fuchsius** has done, who was of Opinion, that there was no such thing in the World as *native Ambergris*, but that it was all factitious. But let us leave this idle Opinion in the Grave with it's Author, and consider rather whence Ambergris is brought, and in what manner Commerce usually brings it before us.

Ambergris is mostly brought from the *East-Indies*, from and about the Islands of *Madagascar*, *Molucca*, *St Maurice*, *Sumatra*, *Borneo*, *Cape Commorin at Malabar*, and from the Ethiopian Shoars, which are said to produce Ambergris from *Sofala* quite to *Brana*. Besides as Ambergris is carried to great Distances by the Sea, there are a hundred other Places in the World, where it may be found.

It is worthy of our Consideration, that this precious Bitumen is frequently found in very large Masses. I will not insist upon what *Faber Lyncaeus* relates from *Gregory de Bolivar*, that there are Pieces of Ambergris found, weighing 100,000 lb. much less what is extant in *Gracias ab Horto*, that there are whole Islands full of Ambergris, much less shall I regard what is told by one *Isaac Vigny*, a Frenchman, who had travelled, that he knows a Country, so rich in Ambergris, that a hundred Ships might be laden with it. These I say are mere hyperbolical Fictions; but the following are credible, or may serve at least to prove the Certainty of great Masses of Ambergris being found.

In 1555, at *Cape Commorin*, a Piece of Ambergris of about 3000 lb. was found, and sold at that Time for Asphaltus, or common Bitumen. *Job. Hugo Lindschot* says, there was a Piece formerly found about this Cape weighing 30 Quintals. *Monardes* and *Hernandez* mention Pieces of 100 lb. *Gracias ab Horto* mentions one that was of the bigness of a Man, and another that was 90 Hands breadth in Length, and 18 in Breadth. *Montanus* speaks of a Piece of 130 lb. which was kept by the King in

* *Fuchsius de Compos. Medicamentor. Lib. I. pag. 211.*

Salsama, in 1659. In 1666 a Piece was thrown up at the River *Gambia* near *Cape Verd*, that weighed 80 lb. and was brought into *Holland*. In 1691 there was a Mals of 42 lb. at *Amsterdam*. *Daniel de Bruel* affirms, that a Piece was found about *Malacca* of 33 lb. There is a Piece at *Rome* as big as a Man's Head. Both at *Rome* and at *Loretto*, and in many other places of *Italy*, there are many Curiosities artificially made of *Ambergris*, which evidently appear to have been made out of very large Pieces.

The above-mentioned *Vigny* brought a considerable Piece from the *East-Indies*, for he sold it for 1300 l. Sterling. *Kaempfer* also testifies, that in his Time a Piece was found in *Japan*, weighing 100 Catti, or about 130 Dutch Pounds.

The two Brothers *Job. Andreas* and *Marcus Matsperger*, in 1613 bought a Piece of *Robert Struzzi* at *Venice*, weighing 48 lb. 8 3/4.

But to mention no more, we have a late and most convincing Example in that great Piece of *Ambergris*, which the Dutch *East-India* Company bought of the King of *Tidore* for 11,000 Dollars. It was at first of the Shape of a Tortoise, weighed 182 lb. was 5 Feet 8 Inches thick, and 2 Feet 2 Inches long. *Chevalier* has given a prolix Description of it in a little Treatise printed at *Amsterdam* in 1700, and has added various Figures representing it in different Views. It was kept many Years at *Amsterdam*, and after it had been shewn as a great Rarity to several hundred, perhaps thousands, Persons; was at last broken to Pieces, and sold by Auction, so that many Persons now alive have been witnesses of it, and consequently it can no longer be doubted that *Ambergris* is found in very large Masses. I would only ask how those *American* Gentlemen can reconcile these vast Masses of *Ambergris* with their Cyst.

3. There are several sorts of *Ambergris*, of which that which has been swallowed is the worst, for it generally retains something of the Stink of the Animal, and therefore may easily be distinguished from good *Ambergris*. Thus also that which is quite black or quite white is of no Value, and that also which seems smooth, uniform, and too pure in outward Appearance, may be suspected, for it is seldom genuine, and is generally adulterated, if not quite factitious. On the contrary, that which is discoloured and streaked, or whitish with Spots of black or yellow, and covered with a blackish Crust, may be accounted the best, tho' it is not quite pure, but mixed here and there with little Bills of Birds, Particles of Cuttle, Spines of Fish, or other Bodies. It is not necessary however that it should be always mixed with such Impurities; but we may choose that which is purest: only it is worth observing, that the best *Ambergris* of all has generally these Mixtures.

The chief Properties of good *Ambergris*, except those already mentioned, are it's being light, and feeling almost like Wax, at the same Time friable, but yet a little tenacious, so as to stick to the Mortar or Pestle, having a fragrant smell, catching Fire readily at a Candle, easily melting

The same
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melting at the Fire, or upon a burning Coal, and having no remarkable bitter, austere, acid, or saline Taste.

The common way of trying whether Ambergris is genuine or not, is to run a hot Needle into it, when something like melted Resin ought to stick to the Needle; or to throw it upon burning Coals, or to melt a little of it in a Silver Spoon over a Candle. This Proof indeed has its use, but if you are not exactly acquainted with the Smell, and observe many other Circumstances, but only attend to this melting, you may be deceived; for the factitious Ambergris may answer this Trial: Nor is that Proof more certain, which is recommended by *Etmuller*, who says that the true Ambergris softens in the Hand like Wax, but the factitious is friable; which properly may easily be given by Art, and is not always found in that which is genuine.

Ambergris is adulterated with Wax, Resin, Storax, Benjamin, Amber, Laudanum, Musk, Civet, Lignum Aloës, rotten Ash, Rice Flour, Tree-Moss, and such like, whilst one Impostor strives to improve upon another, in finding a still better Proportion and Mixture. But this Fraud is easily discovered.

Factitious Ambergris is generally uniform, all over of the same Colour and Mixture, like a mass of Pills, or a Paste, which never happens so equally in the true.

The false Ambergris commonly softens in the Hand sooner than the true.

But the factitious Ambergris is best known by the Smell; for as the true Smell is quite Specific, and not to be compared with any thing else in the World, so it cannot easily be imitated by Art; but the Smell of one or other of the adventitious Ingredients will prevail and discover the Fraud; and this will appear more evidently, if it is thrown upon Coals, or melted in a Silver Spoon over a Candle: or if you hold a Piece of it to a Candle, you may distinguish the Smell, and at the same Time observe its melting and flaming: If the Ambergris is genuine, it will bubble as it melts, and after melting remain brown, and give a Smell like Amber, only not so strong: But if it is spurious, these Properties will fail one way or other. For it will either not melt at all, or too soon, or too late. In melting it will yield something either fetid, or too fragrant, or of a quite different Smell from the Exhalations of true Ambergris, after burning it will not have the same Appearance with Regard to Colour, and will look like a Coal, or Ashes, or Earth.

But if the adulterated Ambergris should have no foreign Smell, but be compounded with some inodorous Substance, such as the ash coloured Tree-Moss, yet even then the Fraud may easily be detected: for such Ambergris will have too weak a Smell, and being thrown upon the Coals will make a great Smoak, if not stink; nor will it melt so equally in every Part, nor will it bubble in melting like the genuine. Lastly, it will not catch so easily at the Candle, nor flame without Intermission till it is quite consumed, as the genuine Ambergris will.

Besides.

Besides all fictitious or adulterated Ambergris will discover itself in dissolving, and appear quite different from the true.

Lastly, not to mention any more Trials, the false recedes in Distillation by an open Fire.

Therefore the true Ambergris is a *Bitumen*, and comes the nearest to Amber of any Bitumen yet known, approaching very near to it, except in Hardness and Transparency.

Tho' the Word Bitumen signifies only a Mineral Compound, yet most Writers of Natural History have restrained it to signify a *tenacious Fat of the Earth, easily catching Fire*, with which Character our Ambergris perfectly agrees. The Basis and greatest Weight of it's essential Parts are Fat and Oil; and in one Dram of Ambergris there are at least $\frac{3}{4}$ or $\frac{1}{2}$; so that if we take it's Denomination from the principal Part, it may be called a *Fat*. But as this Fat or Oil is neither vegetable nor animal, but evidently mineral, it may properly be called a *Fat of the Earth*. That it is a *tenacious Body*, or a *tenacious Fat*, will not be disputed; for otherwise it would be easily pulverised, and not stick to the Mortar and Pestle. And that it *easily catches Fire* may be evident to any one, that will but hold it to the Flame of a Candle. Thus there is nothing wanting of any of the requisite Qualities of a Bitumen.

When I said that Ambergris comes nearer to Amber than any other Body, it was not out of any vain Imagination or Conjecture, but from Experience. For Ambergris being melted in a dry Form over a naked Fire, and so gradually exhaling, or being thrown on a burning Coal, discovers a plain Smell of Amber. And if it is put in Water over the Fire, it melts just like Resin, and gives a Smell to the Water, tho' it does not mix with it. And this Smell is easily separated again by Distillation; but the surrounding Moisture at the same Time hinders the Resolution of the Compound, and the Exhalation of some of it's essential Parts. In short, by this Method the Amber Smell does not discover itself so well as by melting it dry.

Ambergris has the same Effect in the Preparation of Varnish as yellow Amber, that is, if it is melted, and Linseed Oil quite freed from Water is poured upon it, or if other Varnishes, that are not very oily, are mixed with it.

But nothing shews Ambergris so well as the Distillation of it by an open Fire, for here every thing has exactly the same Appearance as in Amber. The Learned and Famous Herman Nicholas Grimm, who was a long Time in the East-Indies, distilled gradually $\frac{3}{4}$ of Ambergris in a Glass Retort by an open Fire, and obtained first an aqueous Liquor, then (as he expresses it) a spiritual Liquor, also an Oil of a yellow Colour, a small Quantity of volatile Salt, besides a Residuum like Pitch in the Retort. He declares plainly at the same Time, that the Liquor, Oil, volatile Salt, and Residuum, and so all the Parts, have the same Appearance and the same Properties, as the Parts coming from the Distillation of Amber would

would have, excepting only that the Oil yielded a Smell rather more fragrant*. I have repeated this Experiment myself, and found every Thing the same, with this only Difference, that there was no substantial Residuum, but only a little Powder from 3i of Ambergris, hardly amounting to a Grain. But this does not by any Means derogate from Mr Grimm's Experiment, for the Difference arose from his stopping a little too soon in his Distillation, or not letting the Fire be strong enough at the latter end, in which Case such a Residuum remains. And this very Circumstance makes very great Alterations in the Residuum of Amber; and for my Part, I continued the Distillation of the Ambergris as long as I possibly could, that I might discover whether there would remain any materially fixt, or saline, or at least terrestrial Residuum. But there remained nothing substantial, only a small Quantity of an almost invisible Powder; and thus I found that Ambergris might be totally distilled by the Continuation and Violence of the Fire. From 3i of Ambergris I obtained ʒijss of Oil, gr. v. of Water, gr. ij of Salt, and about gr. i. of Powder. The other 2 Grains were lost, partly by sticking to the Sides, partly by exhaling and evaporating: the Oil and Salt, as the 2 principal Parts, were of the same Nature as the Oil and volatile Salt of Amber, and consequently by no Means urinoso volatile. From which Proportion of the Ingredients or constituent Parts, this Consideration may be drawn, that this so little saline and terrestrial Substance, is able however to condense a far greater Portion of oily Parts, or to reduce it into a firm, tenacious, and dry State; also that this Circumstance agrees for the most Part with Amber, and consequently confirms it's Affinity also in this Part. I shall add one Thing more, that it is not easy in all Sorts of Amber to separate any thing substantially saline, seeing that a small Quantity of it is easily involved in a large Quantity of Oil.

Since therefore this precious Material exerts it's Powers chiefly in yielding a fragrant Smell, it has hitherto been chiefly employed where a sweet Smell is desired, as in Balsams, Sneezing Powders, Dentifrices, Electuaries for the Teeth, Powders for the Hair, Wash-balls, and in giving a Scent to Garments, which are Things rather of Delicacy than Use. Since also in former Times many medicinal Qualities, analeptic, aphrodisiac, cephalic, apoplectic, bezoardic, and many other Virtues were ascribed to it, it has been used in the Shops much more than at present, in different Preparations and Compositions, rather Galenical than Chymical, and most commonly in Powders. But I shall pass all these over, and mention only one, which has been hitherto the most usual Preparation of Ambergris, namely the simple Essence of Ambergris, in which there is nothing but Ambergris with a Menstruum, and the rather, because in the Solution of Ambergris I have made an Observation or two, which I have not found as yet in any Piece that has hitherto been published.

* Ephemer. Nat. Curios. Dec. xi. Ann. 1. pag. 405.

It has been hitherto looked on as a Maxim, that *Spirit of Wine rectified per se* does not dissolve Ambergris; and from hence Authors have taken their Argument, or this Conclusion, that Ambergris is neither vegetable, nor animal, nor a resin, nor an oily pinguedinous or resinous Body, but a *bituminous Mineral*, because rectified Spirit of Wine *touches it very little, much less dissolves it*, but has the same Effect upon it as on *Asphaltus*, Bitumen, Amber, and other bituminous Compounds, from which it extracts very little, but never forms a perfect Solution. The learned *Hoffman* says *, “ All resinous Bodies are easily dissolved and “ extracted by the most rectified phlogistic Spirit of Wine, but *this is* “ *not the Case with Ambergris, which is not dissolved in such a Spirit* “ *without the greatest Difficulty*. And because we observe, that inflammable Bodies, which proceed from the Earth, as Amber, *Jews* “ Pitch, and Pit-coal, are also very hard to be dissolved, and *do not* “ *easily unite* with a very spirituous Liquor, therefore we subscribe to “ their Opinion, who determine, that Ambergris is to be referred to “ the Genus of Bitumen, the Origin of which is in the Earth, &c.” He says moreover, “ since Ambergris is so difficult to be dissolved, “ for this Reason we meet with no genuine Solution of Ambergris in “ the Shops. For they generally prepare it with Musk, Civet, or essential Oils of Cinnamon, &c. and so we have indeed an Essence of a very “ sweet Smell, which is not without it’s Virtue and Use, but *partakes* “ *very little of Ambergris*, which rather remains *untouched*.” So much as has been hitherto known in the World of the Solution of Ambergris in an inflammable or burning Spirit, has been produced by *Hoffman*, nor has any other fundamentally confuted his Opinion; chiefly as such a Solution in general, especially *in the most rectified Spirit of Wine per se*, has not only been thought very difficult, but a total Solution of it has been accounted impossible. But since I have found by Experience, that it is not only possible, but easy too, I hope a Discovery of it will be very acceptable.

This whole Business requires only a *little Management*. Take good tartarised Spirit of Wine highly rectified, (though in Case of Necessity simple Spirit of Wine not tartarised but highly rectified will do) put into it $\frac{1}{12}$ Part of pure, genuine Ambergris, in small Pieces, put it in a gentle Digestion, which may heat gradually, till the Menstruum just begins to boil; and you will have a total Solution. I have always dissolved ʒij of Ambergris in ʒi of Spirit, and have found only the impure Part that is mixed with it, weighing only 2, and sometimes not above 1 Grain, as a *Residuum* at the Bottom of the Glass. If any one would make an extemporary Trial of this Affair, let him do it in a Glass not quite full, and stopped gently, not too close for fear of breaking, over Embers, or rather over the Flame of a Candle, and as soon as the Spirit begins to boil he will be convinced of the Truth. But if

* Observ. Physic. Chym. select. Lib. I. Observ. xviii. pag. 67, &c.

an *oily* inflammable Spirit is used for the Menstruum, whether it is drawn from any oily Vegetable, or whether any essential Oil is dropped into a highly rectified Spirit of Wine, the Solution will proceed *the more quickly*; but *neither Spirit of Roses*, nor any other abstractitious Spirit, *unless it is full of oily Particles*, succeeds better than plain Spirit of Wine highly rectified.

The following Circumstances are worthy of Observation.

1. If plain Spirit of Wine highly rectified, without any alkali, or tartarised Spirit of Wine is used, then there is a total Solution made in the above-mentioned Proportion; but this Solution, or Essence of Ambergris as it is called, *is not tinged with a sufficiently deep red*.

2. The Residue is of *no small Bulk*, so that great Part of the Ambergris seems to be undissolved; whereas, in reality, if the Solution is filtrated, and *what remains in the Filtre is dried and weighed*, it is found to be very little, a mere Powder, or something lightly terrestrial, if the Ambergris made use of was genuine.

3. If the Spirit was not sufficiently dephlegmated, or if a sufficient Heat was not applied, then either no Solution, or only a mere simple Extraction follows.

4. But if tartarised Spirit of Wine, which has stood with Salt of Tartar only in Infusion, without a following Abstraction, is used in the Solution, then the Solution will be *sooner* and better tinged.

From these 4 Circumstances proceed the following Consequences and Explications.

(a) As a Colour is generally looked for in the Essence of Ambergris, many perhaps have had a Solution with Spirit of Wine, which *not being much coloured*, has not been known to be what it was.

(b) And the rather because they saw a *Residuum so copious in Appearance*, which at first deceived me, so that I thought little or nothing had been dissolved, till by drying and weighing it I perceived it was not only very little, but a mere foreign Powder, that had no Relation to the Solution or Essence of Ambergris.

(c) If this Solution has not succeeded according to Expectation, then either the Spirit of Wine has not been *sufficiently rectified*, or else a *proper Heat* has not been used, and perhaps most have thought Ambergris to be a fragrant Substance, which, if it is too strongly digested, or exposed to a strong Heat in Infusion, will let the best and most subtle Part exhale, and therefore that a gentle Heat is to be used; though indeed such a vehement Heat is not required for *all Sorts of Ambergris*, and yet the Solution has succeeded.

(d) In the last Place, this Conclusion follows, that, if any one has a red Essence, and has used nothing besides the Menstruum but Ambergris, the Menstruum was *Spirit of Wine tartarised by Infusion*, whence the Tincture does not proceed originally from the Ambergris, but from the *fixt alkaline Salt*, which then is only exalted by the oily Parts of the Ambergris. The Certainty of this Circumstance appears, if a most rectified

rectified oily Spirit of Wine is digested *only with Salt of Tartar per se*, for this will produce a red Tincture, which they call Tincture of Tartar. If this Spirit of Wine is not oily, then neither the Tincture of Tartar will be so beautiful, but only tinged with a yellowish Colour, or none at all. But if you add a Drop or 2 of *essential Oil*, for Instance, Oil of Anniseed, you will see the Colour grow deeper in a Moment.

The Conclusion therefore is this: (α) That if a pure rectified Spirit, or Spirit of Wine tartarised by Abstraction, is used, there *happens a complete Solution, but without any particular Tincture*. (β) But if Spirit of Wine tartarised by Infusion is used, the *Solution is tinged*; and this Tincture chiefly depends on the *Salt of Tartar being* more in Substance, and is to be considered rather as a Tincture of Tartar so far as relates to Colour. (γ) But if it appears deeper coloured than Tincture of Tartar, then the *oily Parts of the Ambergris* contribute to the Increase of the Colour, in the same Manner as if a Drop or 2 of essential Oil had been added to Tincture of Tartar. (δ) If therefore *alcalised Spirit of Roses*, made either by Fermentation or by repeated Abstraction upon Roses, is used for the Menstruum, and a fine Essence of Ambergris is procured, it ought not to be concluded, that Spirit of Roses *alone is a singular Menstruum appropriated to Ambergris*: for this is only what I have said before, that in alcalised Spirit of Roses there is *something of an alkaline Salt*, and *some oily Parts*, which raise a Tincture in the same Manner as if the Tincture of Tartar was prepared of Salt of Tartar with an *oily Spirit of Wine*, and without either Ambergris or Roses, and the Solution of Ambergris always proceeds in the same Manner as a Solution with another tartarised Spirit of Wine, or even with a simple rectified Spirit without Tartar.

But that such an Essence or Solution of Ambergris, which has been rightly prepared with good *Spirit of Roses*, should afford a *stronger and more pleasant Smell*, than when it is prepared with simple Spirit of Wine, is quite natural. For Spirit of Roses by itself has a *strong and fragrant Smell*, but simple Spirit of Wine has *none at all*. Besides it is well known, that Ambergris does not by itself give any *remarkable Smell*, but as soon as any fragrant Body is mixed with it, the *Smell and Fragrance of the Ambergris* is at once in a Manner awakened from Sleep, and really exalted.

Therefore it is not without Reason, that the officinal Essence of Ambergris may be prepared with alcalised Spirit of Roses, because of it's stronger Smell. But since many cannot bear the *Smell and Taste of Roses*, these will be in the right, who besides this rosated Essence, keep also in their Shops the *pure Essence of Ambergris* prepared only with highly rectified and alcalised Spirit of Wine. But that this Tincture may be sufficiently efficacious, and the Solution sooner made, and the Colour fixt, it will be of Service to *alcalise the Menstruum doubly*. Therefore take good tartarised Spirit of Wine by Abstraction, or *distil* a genuine rectified Spirit of Wine with a fixt alkaline Salt; and this be-
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ing once alcalised, must be poured again upon a pure and calcined fixt alkaline Salt, digested for some Time, then decanted, and used as a Menstruum for the Essence or Solution of Ambergris. This, by Reason of its dissolving Power, will act in the same Manner as the best and most precious Spirit of Roses, nay will hardly yield to it, unless the Spirit of Roses was tartarised or alcalised.

It remains now to prove and demonstrate what I have said; that an inflammable oily Spirit promotes and accelerates the Solution of Ambergris, which is visible to any one. Take the most rectified inflammable Spirit, and put into it some Bits of Ambergris, if you find they will not yield, put in some Drops of pure distilled essential Oil, not adulterated with expressed Oil, then what I have said will soon be manifested. The Reason of this is no great Mystery; for such Oils themselves dissolve Ambergris. I have tried the Experiment not only with various aromatic fragrant essential Oils, as Oil of Lavender, Mint, &c. but also with the Italian Oil of Citron (*oglio di cedro*), and with the resinous Oil of Turpentine, and also with rectified Oil of Amber, and have always perfected the Solution with these Oils. On the contrary, not the least Solution or Extraction could be procured with an expressed Oil, as Oil of Almonds. Hence it evidently appears, Schroder's * Essence of Ambergris, who tells us first to digest and express Ambergris with Oil of Almonds, and afterwards to abstract rectified Spirit of Wine upon this Expression, is absurd, rather hindering than promoting its Disposition to dissolve.

In like manner I have made Trials, with an Intention to dissolve Ambergris, with dulcified Spirits, both alkaline and acid, and have therefore infused and digested Ambergris with the dulcified Spirits of Vitriol, Nitre, and Salt, and also with dulcified alkaline Spirits, such as dulcified Spirit of Urine, or the vinous Spirit of Sal Ammoniac so called, prepared with quick Lime or Salt of Tartar; but these have extracted little or nothing, nor would they in the least take hold of the Ambergris or dissolve it. There was something singular indeed in the Infusion with dulcified Spirit of Vitriol; for this Spirit, with what little it had extracted, formed some saline Particles, which fastened themselves to the Side of the Glass, in which the Infusion was made.

In the last Place I shall add something about that white, viscid Substance, appearing like Suet, which commonly precipitates, or separates itself from the Solution or Essence of Ambergris, which Lemery takes to be Wax, and uses as an Argument to prove that Ambergris is nothing but Wax, or a Product of Bees, in which Opinion this Gentleman, however otherwise judicious, is mistaken.

1. If this white Substance separates itself, I have commonly observed 3 Circumstances, one of which at least, if not all 3, is required for the Precipitation. For either the Solution has stood in a Glass not quite

* Pharmacop. Medico-Chymica, Lib. iii. cap. 29. pag. 502. Edit. Witzel. 1677.

full, but only filled to $\frac{1}{2}$ or $\frac{3}{4}$ Part, or the Orifice of the Glass has been negligently stopped, whence the most subtile Spirit has by Degrees exhaled, and therefore in Proportion to this Exhalation some Part of the dissolved Amber has fallen again, or else the Solution has stood upon some Part of the undissolved Ambergris. For if the Solution is immediately decanted, the Glass quite filled with it, and carefully stopped, and all Exhalations avoided, then there has not easily been any Precipitation, nor would any such white Substance appear, and so the *Evaporation of the finest Spirit is the true principal Cause*, so that what was before dissolved is again let go by this Spirit as it flies off. 2. This whitish Substance, which Lemery takes for Wax, is nothing else but the *depurated or perfectly reduced Ambergris*: for the most rectified Spirit of Wine, or other Menstruum used in this Solution, if I treat this whitish Substance in the same Manner as I did the Ambergris, dissolves it again and imbibes it. On the contrary, let the Proof be made with Wax and the most rectified Spirit of Wine, and see whether this Spirit will easily dissolve, imbibe, or mix itself with the Wax in the same Manner, to omit other Circumstances.

I could add an Observation or 2 more concerning the *compound Essences* and other *Preparations of Ambergris*; but as this Discourse has grown to a much greater Length than I at first intended, I shall rest here, thinking what I have already said sufficient, and shall be much obliged to any one, who shall favour me with better, more sufficient, and more *demonstrable* Accounts of Ambergris, its *Origin, Nature, and Composition*.
Berlin, Oct. 15, 1729.

An Account of the Experiments relating to Ambergris, made by Mr John Browne, and Mr Ambrose Godfrey Hanckwitz, FF. R. S. with Mr Newman's Vindication of his Experiment, drawn up by C. Mortimer, R. S. Secr. Ibid. p. 437.

4. Mr Browne and Mr Godfrey, two most experienced Chymists, and Fellows of the Royal Society, were desired carefully to repeat Mr Newman's Operation upon Ambergris.

Mr Browne thinking 3i, which the learned Professor had used in his Experiment, to be too small a Quantity, took 3iss of Ambergris, reduced to Powder with very dry Tobacco-pipe Clay, which he always uses in order to obtain the Salt of Amber. He exposed it to various Degrees of Heat in a Retort, and obtained first a clear Phlegm like the purest Water, then a brown Spirit like that of Malt, which was succeeded by an Oil of a browner Colour, and lastly by a very strong Fire a thick black Balsam. He confesses that the Oil and Balsam agree in Smell with those obtained from Amber; but he could not obtain any volatile acid Salt as from Amber, nor did this Spirit of Ambergris make any Motion with alkaline Bodies, as that of Amber does, which abounds with such an acid Salt. He looks upon that volatile Acid as the true *Criterion* of Amber. The *Residuum* also from the Distillation of Amber is hard, and black like Jet; but from this Distillation the Tobacco-pipe Clay remained in Powder, but just tinged with black. Therefore as he could not discover through the whole Operation any Acidity, or any Volatility, he leaves it as a Doubt whether Ambergris is an animal

mal Excrement or not: but he observes that all that is odorous or agreeable is lost by a very gentle Fire.

Mr. Godfrey first distilled with a Retort 3ij of Ambergris mixt with twice the Weight of the purest white Sand. Secondly he distilled two Ounces more in like Manner, and had in both Operations a limpid Oil and a bituminous *Residuum*. The Oil being rectified *per se*, afforded a Phlegm of a grateful subacid Taste, like a mild Vinegar, and then followed a limpid, balsamic, bituminous Oil, like *Petroleum*. Thirdly he distilled 3is of Ambergris by itself, and obtained the same by a pretty moderate Fire. After he had distilled the Ambergris to the utmost Driness, he urged the *Residuum* with a very great Fire; and there remained at last gr. iij of a white, saline Earth, fermenting a little with Acids, or running *per deliquium*, when exposed to a moist Air. As he could not obtain any volatile Salt, or any Phosphorus from the Coal, or blackish *Residuum* of the 2 first Operations; he pronounces that Ambergris is most certainly neither any animal Substance, nor the Excrement of any Animal; for he can obtain Phosphorus from the Dung of all known Animals*. Therefore he determines that Ambergris is a Bitumen coming very near to Amber; but he does not allow it to be a true Amber, because it does not yield an acid volatile Salt like that of Amber.

He repeated the Experiment again with equal Parts of Ambergris and powdered Glass; because it might be suspected that something of an alkaline Earth might have been detained in the Sand, and have absorbed the Acid of the Ambergris, if there was any in it. But the Operation exhibited the same; only the Phlegm had a Taste of a neutral Salt, not acid; and after melting the powdered Glass, the bituminous *Residuum*, free from the glassy Mass, lay upon it like a black Coal, and had dispersed itself through the whole internal Face of the Retort quite up to the Neck, in Form of black Flours or Flakes, very thin and shining.

The whole Dispute about these Experiments may easily be composed, if Ambergris is but considered as a mixt Substance composed of various foreign Bodies, like other Minerals, and not as a simple, pure Body like Metals; for no Ore of any Metal whatsoever, for Instance, Lead, affords in every Part an equal Quantity of Metal, or certain Mineral mixt with it. In like manner various Parts of Ambergris do not contain the same Quantities of that acid Salt; as we see in Mr Godfrey's Experiments; for in one the Phlegm had a subacid Taste, an indubitable Sign of that Salt, in the other a Taste of a neutral Salt; and the Part examined by Mr Newman had more of such a Salt than the rest. Besides the more the Salt is intangled with Oil, the more difficult it is to be separated. It has happened in like manner in some Experiments with quick Lime, as Mr Newman mentions in a Letter to Mr Godfrey, in which he tells him, that it has succeeded differently in France from

* See below, §. V. Art. 2.

what it has in *England*; whence a certain *Frenchman* has declared, that the Experiments in *England* were quite false. Moreover Mr *Newman* has written to Sir *Hans Sloane*, that he would not be understood to mean that Ambergris is really Amber, but only that it is of the Genus of Amber, or a Bitumen approaching very near to Amber, which was the Opinion of the Ancients, who called both AMBRA, distinguishing common Amber by the Epithet *Citrina*, and Ambergris by *Odorifera*. He adds in the last Place, that he cannot be deceived with Regard to that volatile acid Salt, of which he obtained a Grain or two, for it dissolved in Water like Salt, and turned the Syrup of Violets red, like other Acids; and it must be volatile, having risen in Distillation.

A Method of making Soap-Lees and Hard Soap, for Medicinal Uses, by M. Claud. Jos. Geoffroy, F. R. S. No. 463. P. 71. dated, Paris, July 23, 1741, N. S. read April 1, 1742.

III. To make the Lee, I take, for Instance, of the best calcined Lime, that has been the least exposed to the Air, 5 lb; of good Salt of *Kali* or Glass-wort of *Alicant*, pulverized, and passed through a fine Sieve, 10 lb. I divide the Lime and the Salt of Glass-wort (called in *England Barillia*) into 2 equal Parts; then I put the Lime, broken into Pieces not bigger than an Egg, into new stone Pans, and cover it with as much Salt of Glass-wort as is designed for each Pan. I pour afterwards on these several Mixtures hot Water by little and little, to give Time to the Lime to open itself, till it turns into a sort of Meal, which will happen after I have poured 3 half Pints * into each Pan. I then add to it the rest of the Water that is required, stirring this Mixture with a Stick of white Wood; when there are 18 or 19 Quarts of Water in each Pan, there is enough for dissolving the Salts. In this State the Pans are left for 12 or 15 Hours; after which this Lee is filtrated through brown Paper, supported by a coarse Cloth, fixed to the 4 Corners of the filtering Frame. When the whole Mass of the Lee and of the Lime is well drained, I put it into an iron Pot that is very clean, with 10 Quarts of Water, to the Quantity taken out of each Pan, and let it boil an Hour; then I filtrate it a second time. Afterwards it is put into another iron Pot that is very clean, and as it evaporates by Degrees, it is filled up again with the first Lee prepared, without boiling. I let it continue to evaporate till the 28 Quarts of Water, that have been used for making the Lee of the Mixture that was at first put into each of the Pans, be reduced to 2 Quarts and $\frac{1}{2}$ a Pint, or so long till a small salinous Film forms itself on the Top of the Lee. This Liquor turns almost black, because it corrodes the Iron; but this is no Inconvenience, as will appear hereafter. In this State of Concentration, if one lets a Drop of it, whilst it is hot, fall on a Piece of Glass, it will be very quickly covered with a fine and greasy Film, which makes it look as if it was congealed. At the Bottom of this Lee is found a Salt in Flakes, which, being melted in a Crucible, produces a *Lapis infernalis* of a strong caustic Power. One may know also, that the Lee has acquired the necessary Degree of Concentration,

* The *Paris* Pint is near a Quart *Engl.*

when, becoming more active, one sees, that the Edge of the Pot that has been wetted by it, turns red, whilst the lower Part of the Side all around, down to the Surface of the Liquor, takes a greenish Colour. Then the Pot must be taken from the Fire, and the Liquor left to cool so far as to be put into Glass Bottles without cracking them: The Bottles ought to be carefully corked, not only to prevent the Salts contracting a Dampness from the Air, which would lessen the Degree of forced Concentration, which has been acquired by the Evaporation, but also to preserve what is sulphureous, which would exhale, if the Liquor remained long exposed to the Air: For I suspect, that that Sort of *Hepar*, formed by the Union of the caustic Salt with the Sulphur of the Ashes of the Glass-wort, ought not to be neglected. Now, the better to direct those who have a Mind to work after these Processes, and to furnish them with the Degrees of Concentration this Lee is to have, in order to make with Oil a solid Soap out of it as speedily as possible, I take a glass Phial with a narrow Neck, and fill it with clear Water up to a Mark made on the Neck. That which I now make use of, being filled up with Water to that Mark, contains just Zij : I afterwards empty it carefully, and, instead of clear Water, I fill it with that concentrated Lee as far as the foresaid Mark, and then I weigh it. If the Weight be increased $8\frac{1}{2}$ or 9 Drams, that is, near 3 Drams in each Ounce, this shews that the Lee is neither too much nor too little concentrated. A hydrostatical Balance, a Water-poise, and other Instruments, might also give this Degree; but in the Country they are not at hand; and I judged it best to point out only what is most easy. Soap-boilers use for this End a fresh Egg; if one half of it sinks into the Lee, they judge the latter to be of the first Strength, that is to say, that this is the Lee which they ought to employ last of all in their Manufacture; if the Egg sinks in to $\frac{2}{3}$, the Lee is called the Second; and, lastly, if the Lee covers the whole Surface of the Egg, it will be called the First, and will be that with which they begin their Operation or Boiling. But this Way of trying has not all the Exactness which can be desired, because all Hens Eggs have not the same specific Gravity. Besides, as I make my Soap without Fire, I must take the Lee that is most concentrated.

Lest the Iron, which is corroded by the Lee, should enter into the Composition of the Soap, one need only to evaporate the Lees in earthen Pans put over a *Balneum Mariæ*; but as this Evaporation is slower, it will consume much more Coals. One may even see in those Pans by different Marks, that the Liquor approaches the desired Degree of Concentration, partly by a Piece of Wood marked with Notches, partly because if there is the least ferruginous Speck in the Earth of those Pans, the Liquor will penetrate that ferruginous Place, and make a Spot there. By using earthen Pans you will get a very limpid Liquor, and which will only have a very pale Straw-colour, even after it's perfect Concentration.

The Lee prepared in Iron, being kept for some Time, clears up, and leaves a black Sediment, which is that Part of the Iron which it has separated by corroding the Sides of the Pot. And yet this ferruginous Lee, together with the Oil, will form a white Soap, if one has let that black Sediment precipitate. This Sediment is true Iron: I have made myself sure of it, by calcining it in a Crucible, after having moistened it with Oil.

One Ounce of concentrated Lee to the Degree above-mentioned contains Zij gr. xvij of Salt; when I dissolve this Salt again in distilled Rain-water, and filtrate it, I find in it gr. iij of coarse Earth, which cannot penetrate the Pores of the Filtre.

If I use it to make Soap of it, I take one Part to two Parts of the best Oil: I mix them gently in a *China* Bowl, stirring them with a *Spatula* of white Wood, till both Liquors are come to a Consistence of Butter that is churning: This Thickening is much sooner done in Winter than in Summer. I keep the Vessel in a dry Place, that the Moisture of the Air may not diminish the Strength of the Lee. The Mixture from Day to Day grows to a Body, and when it is in the Sun in Summer, and upon the Mantle of the Chimney in Winter, the Phlegm evaporating sooner, it becomes perfect Soap in 4 or 5 Days, provided the Lee be sufficiently concentrated. It will be well however, that during the Time the two Liquors are binding together, the Mixture be stirred with the *Spatula*, that the Water may not be kept in, but evaporate the sooner. When the Soap is made, it easily comes out of the Vessel, but it has not yet lost all that Moisture it should lose; so that though one may use it in that State, yet it is better to keep it 12 or 15 Days longer; at the End of which Time if I decompound it, I always find the whole Oil I have employed; that is to say, out of 3xviij of this perfect Soap, I get Zijs of Oil, and Zij gr. xxij or xxiv of Salt of Glass-wort. So after this Method a Patient may easily make his own Soap, and be sure of the Ingredients; perhaps even in the great Manufacturies, one Day or other, they may prefer this to that which is now in Use.

As to what relates to the Oil of Lime*, of which I have spoken in my Experiments, it is the *Caput Mortuum* of the *Sal Ammoniac*, after Distillation of the volatile Spirit by the Means of Quick-lime; it is exposed in a flat Vessel to the Moisture of the Cellar, whence a *Deliquium* is formed, which we call Oil of Lime. It is Lime dissolved by the Means of the Acid of the Sea-salt, which is contained in the *Sal Ammoniac*; other Chymists call it the fixed Liquor of *Sal Ammoniac*. Your Soap-boilers are obliged to add Sea-salt to their Soap, which I believe, for my Part, comes from their making use of Pot-ash in their Lees, which they would have no Occasion to have recourse to, if they employed true Salt of Glass-wort, seeing my strong Lee of Salt of Glass-

* Huile de Chaux.

wort makes Soap immediately; besides, the Salt of Glass-wort contains Sea-salt, which I have demonstrated by making Salt of Glauber with pure Salt of Glass-wort and Oil of Vitriol: If instead of Salt of Glass-wort one makes use of Pot-ash with Oil of Vitriol, it will not make Salt of Glauber, but instead of it produce Tartar vitriolate.

In describing this Sort of Soap, I had no other View, than not to deviate from the Way of making *Alicant Soap*, and to know well the Proportions, in order to apply them to the making of the Soap I propose, and to fix them with regard to the Lime and the Salt of Glass-wort, which for many and various Reasons is preferable to other fixed Salts, as being that which forms the best, the most deterfivè, and the mildest Soap, as it has been found by Experience in all our Manufacturies.

The Observations which I have lately laid before the Academy, prove that the Oil, which has passed through the Lees of Lime and of Salts, is, perhaps, easier to digest than any other. I there demonstrate, that the Oil separated from the Soap by the Means of Acids, as I have pointed out, is found to have acquired a Property which it had not before; for it dissolves in Spirit of Wine, and perfectly unites with it; which it could not do whilst it was crude, that is to say, before it had formed Soap, or had been boiled with metallic Limes.

IV. Take of the whole Plant of *Nantsjera Patsja* of the *Hortus Malabaricus* any Quantity; cut it and bruise it, and boil it in a sufficient Quantity of Spring Water: Squeeze out the Liquor, add an equal Weight of Sugar, and boil to the Consistence of a Syrup without Clarification.

A Drop or two, with a little Honey, given to new-born Infants, greatly helps the necessary cleansing of the Bowels. Three or four Drops are a safe Puke for them, and cleanse the Stomach and Bowels from that Phlegm that causes their Gripes.

It is of great Service in most Asthma's, and has relieved, when the best Remedies have failed. If the Fit is violent, give a large Spoonful of it, which will soon procure a Vomit or two. If the Fit is moderate, two Tea Spoonfuls 3 times a Day will be sufficient.

In Fevers that are attended with a laborious Breathing, it has been found serviceable.

It is excellent in the Small-pox, as well to vomit in the Beginning, as to help on the necessary Salivation in the Confluent Sort.

It helps Coughs, and promotes Expectoration.

From these few Hints, a Physician will be able to adjust it's Use in other Distempers. I should not recommend it, had not repeated Experience convinced me of it's Usefulness: And that it may be of Use to Posterity, I mean to Physicians that are really such, I give the Receipt of it to be given to the President and Censors of the College of Physicians, *London*.

Mr Alexander Orme's Pectoral Syrup, sent in a Letter to Sir Hans Sloane, Bart. &c. from Calcutte, dated Jan. 25, 1733. No. 461. p 769. Aug. 1741.

An Account of
the Experi-
ments shewn by
Sigismund
August Frobe-
nius, M. D.

F. R. S. at a
Meeting of the
Royal Society,
Nov. 18,

1731, with
his Spiritus

Vini Æthere-
us, and the
Phosphorus

Urinæ, from
the Minutes of
that Day, by

C. Mortimer,
M. D. R. S.

Secr. No. 428.

p. 55. Apr.

&c. 1733.

Fig. 149.

V. 1. He took a Solution of *Phosphorus* in the Æthereal Spirit of Wine, which he called *Liquor Luminosus*, and poured it into a Tub of warm Water; whereupon it gave a blue Flame and Smoke, attended with so small a Degree of Heat, as not to burn the Hand, if put into it.

He poured some of his Æthereal Spirit of Wine upon a Tub of cold Water, and set it on Fire with the Point of his Sword [which being first heated a little, he touched with it a Piece of *Phosphorus* lodged before-hand on the Side of the Tub]. After the Deflagration the Water was cold.

He then shewed a very extraordinary Process with *Phosphorus glacialis Urinæ*, or *Stick Phosphorus*, of Mr Ambrose Godfrey Hanckewitz.

He had a very pompous Machine, which he calls *Machina Frobeniana, pro resolutione Combustibilium*. (inventa anno 1730.) It is really an Improvement of the common Bell, under which the *Oleum Sulphuris per Campanam*, is commonly prepared. This Machine consisted of a concave Plate of Glass A B, with a Hole in the Middle C, which communicated by a Glass Pipe C D, with a Glass Receiver E E F, which stood underneath the Plate A B. Upon the Plate A B stood a massy Golden *Tripus*, sustaining a Bason, about 4 Inches Diameter G H, having within it another smaller one I K, of the same Metal, about 2½ Inches Diameter; this was heated a little: He then took small Pieces of *Phosphorus* out of a Bason of Water, which he soaked up with brown Paper, so that the *Phosphorus* might be quite dry, which he put into a Spoon, and flung it into the smaller Golden Bason I K; where it immediately took Fire: Then he lowered down a large Glass Bell L M O, of about 18 Inches Diameter, and containing $\frac{1}{4}$ of a Sphere; the Rim L M being exactly ground to fit close on the Plate of the Glass A B. This Glass Bell was suspended by a Wooden Circle P Q P Q, to which were fastened 4 Cords, that united into one Knot at R, and from thence went a Rope over a Pulley S, in the Crown of the Machine, and coming down by the Side of one of the Pillars, served to raise up or let down the Bell.

At the first firing of the *Phosphorus*, the whole Bell appeared Luminous, and full of Flame for a few Minutes: When the Deflagration of the first Spoonful was over, he flung in another, and so on, till there were 3ij of *Phosphorus* consumed, from which were sublimed a large Quantity of *Flores* into the Bell, and some fell down upon the concave Glass A B. The Bell at first felt cold, and never grew more than moderately warm. As the *Flores* began to cover the Inside of the Bell to some considerable Thickness, the Flame was not seen thorough so brightly as before, but the whole appeared of a light Azure, or Sky-colour, which the Doctor likened to the Formation of the Firmament: The *Flores* sublimed he likened to Snow. Then the Bell being drawn up again, and the Golden Basons taken out, there remained in the smaller Bason an almost fixed red *Earth*, or *Caput mortuum*. On the Admission of the cold Air, the Snow [*Flores*] began soon to melt as

per

per Deliquium; which he compared to the Formation of Dew and Rain; and as it dripped from the Inside of the Bell upon the Concave Plate A B, it ran through the Hole in the Middle of it C, by the Tube C D, into the Receiver E E F; where it was collected in Form of a clear transparent Liquor, somewhat clammy like Gum-water, which he called *Water*.

Some of the *Flores* mixed with any combustible Matter, as common Olive-Oil, &c. and put into a Golden Bason set over a Lamp, fired immediately, and flamed like *Phosphorus*, being, in reality, *Phosphorus* regenerated, and burnt away to a Substance like Tar.

Some of the clammy Water was put into a Golden Bason set on a Lamp, and by augmenting the Fire *per gradus*, in about $\frac{1}{4}$ of an Hour's Time, when all the airy Bubbles were exhaled, the Liquor became hard like Gum, which had been dissolved in Water, and was nearly dry, and perfectly transparent: *This he called Vitrum Molle*.

Next Day he made some more of this *Vitrum Molle*, which he put into a Crucible heated red hot, and then set it in a Wind-Furnace, and gave it the greatest Heat for a quarter of an Hour; when the Matter in the Crucible appeared fluid, like melted Glass. He then poured it out into an Iron Pan; the Matter remained red hot some time; when it was perfectly cold, it was hard, transparent, and brittle like common Glass; but it soon began to relent, and in twenty-four Hours was almost all turned to Water again.

He said, "If this *Vitrum Molle* be again entirely resolved in the Air, which will take up near 14 Days time, by distilling off the Water, and letting the Remainder melt *per Deliquium* again, till all the saltish Matter be resolved into Water, there remains an insipid whitish Earth, which fluxed in a Glass-Furnace, gives a true fixed Glass."

2. I repeated the Experiment of the Deflagration of *Phosphorus* under a Bell, which had been first shewn to the Royal Society by Dr Frobenius, but I found that a much more simple Apparatus was sufficient, than the pompous Machine he made use of. I took a strong wide-mouthed Glass Jar, which serves as a Stand for the Concave Glass Dish to rest on. In the Middle of the Glass Dish is a Hole communicating with a Pipe, which goes down into the above-mentioned Jar. Instead of the Golden Basons, a China Cup a little warmed, serves perfectly as well for burning off the *Phosphorus*: The last and main Thing is a large Glass Bell, which fits nearly close upon the Glass Dish. This Bell may be easily lifted off and on with the Hands by an Assistant, without any Frame or Ropes to suspend it.

I took one Ounce of *Phosphorus*, which I deflagrated in the same Manner as is described in Dr Frobenius's Experiment, and obtained of the white sublimed Flowers 3x, that is 3ij more than the Weight of the *Phosphorus* before Deflagration: They were so very light as to their Volumen, that they just filled an half Pint Pot.

Some Experiments upon the Phosphorus Urinæ, which may serve as an Explanation to the preceding, with several Observations tending to explain the Nature of that wonderful Chemical Production, by Mr Ambrose Godfrey Hanckewitz, Chemist, F. R. S. *Ibid.* p. 58.

The 3x of Flowers being set in a cool moist Place, exposed to the Air, did resolve into a *Liquamen*, weighing $\text{℥iv } 3\text{ij}$, which *Liquamen* much resembles *OL. Sulph. per Campanam*; but contains an acid Salt, more fixed in the Fire than any other Salt we know of in Nature, and having many other Properties peculiar to itself, which other acid Salts have not.

The *Phosphorus* receives this fixed Acid from the Urine only; for the Salt of Urine is so fixed, that upon a live Charcoal with a blowing Pipe it plays and rolls about like Silver upon the Cupel. Whereas all other liquid Acids evaporate with Ease; this on the contrary is so fixed, as to require a greater Heat for it's Evaporation than that which keeps Lead in Fusion; and the *Phlogistic* Part, notwithstanding it's Lightness, is so intimately and firmly connected with the rest of it's Principles, as to sustain a Degree of Heat equal to that of red hot Iron, during which Heat the Salt sparkles and emits Flames very bright for a good while, which is very wonderful and agreeable to behold; and this Sparkling being over, it remains red hot in Fusion, and perfectly transparent; and by greater Heat may be vitrified, as will be shewn hereafter.

I put the abovementioned *Liquamen* into a Glass Retort, which I set in a *Balneum Mariæ*, and distilled it to a strong Inspissation. It yielded only an insipid Phlegm, except that towards the last it came over a little impregnated with the Acid, but not sharper upon the Tongue than as if it had been a Mixture of Vinegar ℥ss with Water ℥iv .

Then removing the Retort with the inspissated Liquor into a Sand-Furnace, I increased the Heat gradually, so as to make the Sand and Retort thoroughly red hot, till at last the Bottom of the Retort was ready to melt; I then left it 'till next Day, when being perfectly cold, I broke the Retort, and found a most admirable white Salt at the Bottom, which was so united with the Glass as not to be separated from it; and some was spread all over the Retort quite up to the Neck, and, as near as I could guess by View, it seemed to be as much in Quantity, could I have taken it out to weigh it, as the original *Phosphorus* from whence it was produced: It's Taste was very sharp and saline; but notwithstanding it's great Fixity in having endured a melting Heat for several Hours, it relented again in a moist Air, and in a few Days was entirely resolved into a *Liquamen*.

The *Phosphorus*, after it's Deflagration, leaves an almost fixed red Earth, or *Caput Mortuum*, behind it, as is mentioned in Dr Frobenius's Experiment. Although one would have imagined that all the inflammable Parts of the *Phosphorus* had been burnt off in the first Deflagration, which seemed very violent, yet this red Earth retains so much of an unctuous *Phlogistic*, that being placed over a red hot Fire, it swells up, and keeps in Fusion a great while, emitting Flames and Flashes of Light, so long as it is kept upon the Fire; but when cold again, if exposed to a moist Air, it relents and resolves as the Flowers do: For the acid

Fig. 150.

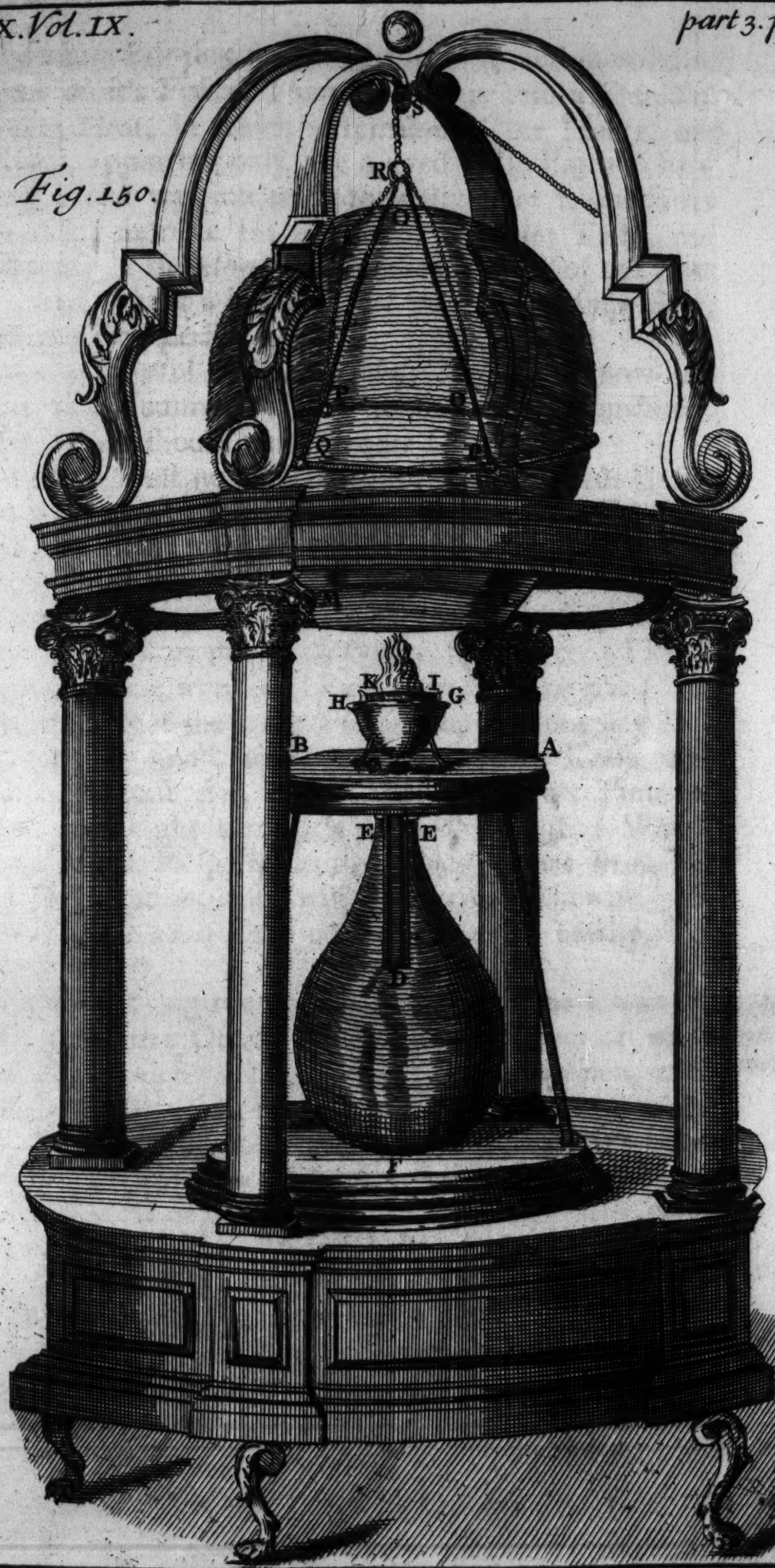
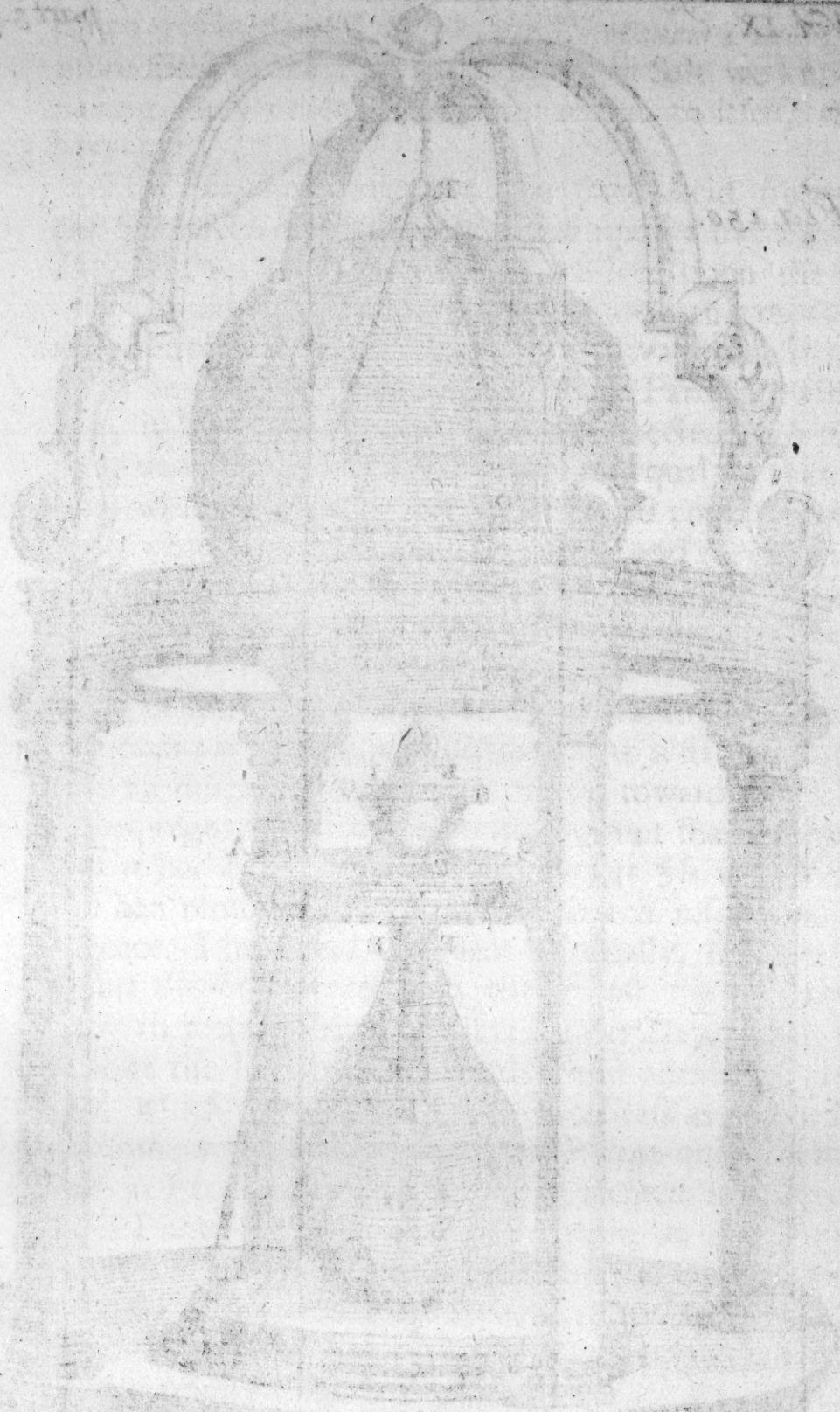


PLATE 17

PLATE 17



acid Salt of the Urine adheres so strongly to it, that although it undergoes several strong Ignitions, it will relent again as often, when set in the Air.

I took some of the white Salt that stuck to the Retort, and in order to try the utmost Degree of it's Fixity, I put some of it into a Crucible, and gave it a vitrifying Heat, in which it remained some Hours, but was not yet run to Glass, appearing only like a fixed white Earth as hard as Stone, and shining as if it was just ready to vitrify; yet it was so far fixed, as not to relent any more in the Air; had no saline Taste, nor was dissolvable in Water. I therefore took another Portion of the same Salt of *Phosphorus*, which I kept a longer Time in the vitrifying Heat, and I found it at last run into perfect Glass.

Thus we see what a wonderful Subject is *Phosphorus*! And how surprising is it that such an inflammable Body, consisting of the unctuous and acid Parts of the Urine, should thus become Glass!

The Conclusion which I must now make from this remarkable Experiment is, That here is a perfect Transmutation of Bodies; the *Phosphorus* being transmuted into a fine transparent Glass of a bluish green Colour, coming nearer to the Hardness of a Diamond than any other Glass, and in the same Quantity as the *Phosphorus* at first used, which, without any Addition, produces this Glass Ounce for Ounce. Here I must stop, having brought these wonderful Experiments to a *ne plus ultra*.

I shall add here further, that the crude *Phosphorus*, without any Deflagration, but only cut very small, or scraped fine with a Knife, and laid upon a Glass Dish in moist Air, will in about a Week's Time resolve into a *Liquamen* near eight times it's original Weight: Which *Liquamen* is the same in all Respects as that which comes from the sublimed Flowers by Deflagration, and may be vitrified likewise. In scraping the *Phosphorus*, take great Care not to do it too hastily, lest by heating it, you set it on fire.

The Chemical *Phosphorus* being the principal Subject of the foregoing Experiments, I shall, upon this Occasion, give some Account of what *Phosphorus* is, and what it chiefly consists of. It is my Opinion, that *Phosphorus* does not naturally exist in Animals by itself; but when formed out of Urine, by the Means of Putrefaction and Fire, it's principal Contexture is found to consist of a subtile Acid concentrated by the Salt of Urine, and of a fat depurated Oil.

Phosphorus affords us so many and wonderful *Phænomena*, that to explain them all would take up a large Treatise.

The *Phlogistic* Part is so slightly connected with the other Principles, that the least Motion, Friction, or Warmth, sets it on fire.

The fixed Part seems to consist chiefly in the acid Salt of the Urine, which is at first so intimately concentrated with the *Phlogistic* Part, as in Deflagration to be hurried up or sublimed along with it; yet being by this Operation freed from it, it becomes fixed, and can by no Degree of Heat be again sublimed.

Phospha-

*Reflections on
these Experi-
ments.*

Phosphorus may be called an urinous Soap, as it consists of the saline and oleaginous Parts of the Urine: But *Phosphorus* is not to be got in so great Plenty out of Urine alone, as when the *Fæces Alvinæ* are elixirated along with it, and then brought to a *Magma* fit for Distillation: Nor is there so great a Quantity of *Phosphorus* in the Urine of other Animals, as of Men; nor is it to be got from any Natural Productions, or any Parts of Animals or Vegetables in their crude State, before they have undergone Concoction in the Stomach of an Animal. How far therefore the *Liquor Gastricus*, the *Bile*, and *Succus Pancreaticus* may contribute to the Formation of it, is a Disquisition I shall not here enter upon, but leave it to the Enquiry of Physicians.

In regard of the Parts whereof *Phosphorus* consists, it may be considered as the Soot of a deflagrated Oil; and so may every combustible Substance be looked upon as a Kind of *Phosphorus*, as consisting of inflammable Materials.

Phosphorus is more immediately compounded of a Salt tending to the Nature of *Sal Ammoniac*, of an urinous Salt, of an Acid, and an oily *Phlogiston*, with a subtile Earth; by the Means of these Salts existing in the Urine, the *Fæces Alvinæ* are the better elixirated, and those Particles extracted which contribute to the forming the *Phosphorus*. Concerning the Fixity of the urinous Salt, I have said enough already, so shall not repeat it here. With these Salts are very intimately combined in the *Phosphorus* oleaginous or fat Particles, which are the proper Materials of that subtile *Phlogiston*, the true *Domuncula Ignis*, and indeed the main Constituents of the whole Compound.

As for the Preparation of this wonderful Production, it is done by distilling the *Saponaceous Magma* in a close Vessel, with a reverberatory Fire, much stronger than that used for the Distillation of *Aqua fortis*, or the other Mineral acid Spirits; the rest of the proper *Encheiresis* belongs only to the Operator to manage *secundum Artem*. When this Operation succeeds rightly, there comes forth, First, a thick unctuous Oil. Secondly, a more subtile Oil, resembling the *Oleum Philosophorum*, which is Olive Oil distilled from Brick-dust. Thirdly, the fixed Acid enclosed in a very subtile Acid. Near the End of the Distillation comes over that depurated Oil which constitutes the inflammable Part of the *Phosphorus*, which is not raised up till the last, and that by the Continuance of a very strong Reverberatory Fire.

But an Operator that is not well exercised in the Degrees of Fire, and doth not know how and when to take away these Oils apart, will have nothing but a volatile Salt, and fetid Oil, and get at last only a little unctuous opaque *Phosphorus*; such as the famous *Kunckel*, *Dr Craft*, and *Brand* did, as they acknowledge in their Writings; but not our hard transparent Glacial *Phosphorus*. Since *Kunckel* therefore, and his Followers, were never able to make the true solid Glacial *Phosphorus*, it was absurd for him to write, that he could make it even out of crude indigested Things, in their natural State; for either this famous Man spoke

spoke too much at large, and had never tried the Experiments, or else he must design to impose upon the World: For I can boldly contradict him in this Point from the several Experiments I have made, but never found any true *Phosphorus*, except in such Things as had undergone Digestion in Animals. And I know myself to have been for these 40 or 50 Years, that is, ever since I left the Laboratory of my Master, the Hon. Mr Boyle, the only Person in Europe able to make and produce in any Quantity the true solid *Phosphorus*.

I did not content myself to work upon the *urinous Sapo* of Man only, but examined likewise the Excrements of other Animals; as for Example, of Horses, Cows, Sheep, &c. and got *Phosphorus*, but not in so great Quantities as from Man; probably, because they feed on nothing but Vegetables. I then examined the Dens of Lions, Tygers, and Bears, making Experiments on their Excrements, and likewise on those of Cats and Dogs, which being carnivorous Animals, I obtained more *Phosphorus* thence than from the other Creatures: My Curiosity led me likewise to the Rat-Nests, and Mouse-Holes, and I had *Phosphorus* thence. I then addressed myself to the feathered Tribe, visiting the Hen-Roosts, and Pigeon-Houses, and got some small Matters thence also: I emptied the Guts of Fish in order to get their Excrements, and had a little *Phosphorus* from these, but none from the Fishes by themselves.

I was next induced by Kunckel's Assertion, to try what I could obtain out of crude Vegetables, viz. Corn and other Fruit: I thought that Putrefaction would bring them the nighest to an *Ammoniac* and urinous State, because of the Heat that is produced in them by it; but my Labour was all in vain. After these Experiments, I took in Hand Fossils and Minerals: I began with the common Fossil Coal, thinking that the *Phlogiston* in this bituminous Substance might have been to my Purpose; but I found nothing therein like *Phosphorus*, there coming over only a bituminous Oil, and at last, by increasing the Fire to the highest Degree, there sublimed some white talcly Flowers, which were neither Sulphureous, nor Acid, nor Alcalick, but insipid like Talc; so I gave up all further Experiments upon other Minerals.

I have often wished for a sufficient Quantity of the Flies which shine in the Dark, whereof there are great Numbers in *Italy*, especially in *Tuscany*; or of our common Glow-Worms, which seem to have *Phosphorus* lodged in their Bodies.

Our *Phosphorus* is a Subject that occupies much the Thoughts and Fancies of some Alchymists, who work on microcosmical Substances; and out of it they promise themselves golden Mountains. Of this Number was the famous Dr Dickinson, Physician to King Charles II: He toiled and laboured many Years in Experiments upon the *Stercus humanum*; and hath several Times, with the greatest Pleasure, shewed me *Metallic Regulus's*, he had extracted from it. This is what I have often done myself, and no Wonder! for we take in daily with our

Food, and sometimes in Medicines, both Mineral and Metallick Substances, besides what metallick Vessels, Kettles, Pots, and Dishes, furnish: We see a Solution of the Metal upon a Knife after cutting any acid Fruit, by the black Spots it hath upon it, and the metallick Taste it communicates to the Thing it cuts.

Dr Lister hath shewn, that Stones out of the human Bladder being calcined, Iron may be extracted from them by a Loadstone: And the great Boerhaave hath made it evident, by various Experiments, that there is scarce any terrestrial Substance either in Men, Brutes, or Plants, which after Ustion doth not exhibit some metallick Particles. Dr Becher saith, that out of Brick-Earth, mixed with any Fat or Oil, and calcined in the Fire, he hath produced Iron: For it is only the Iron that causes the Redness of the Bricks, and can be extracted from them again. Moreover, Metals are dissolved by the Salts and Moisture in the Earth, and so mix with the nutritious Juices of Vegetables; hence it may, in some Respects, be said, that we eat Metals with the greatest Part of our Food.

Having given the foregoing short Account of the Production of *Phosphorus*, I shall here subjoin, that there is produced out of the *Residuum*, after the *Phosphorus* is made, a particular Salt, which I name *Sal Phosphori*, or Salt of *Phosphorus*. This Salt is fixed in some Degrees of Fire, yet it may be sublimed in a close Vessel, which other fixed Salts cannot be, except they still contain somewhat Volatile in them; but this Salt hath no such Thing in it, neither is it any Ways alkalick.

How to produce this Salt, remains as much a Secret as the *Phosphorus* itself; for he that cannot produce this Salt, will never be able to make *Phosphorus*.

There is scarce any Body, out of which a Chemical Operator cannot produce Water and Earth, Salts, or an acid Spirit, and an urinous Unctuosity, in more or less Quantity, according to the Nature of the Body; and where there is one of these, there is Fire to be demonstrated, but not without each other's Help. The *Encheiresis* of this would be too long for this Place, I shall therefore omit it here.

From our Preparation of *Phosphorus*, we may reflect upon the *Fuligo*, or Soot of all combustible Substances; for it is the *Phlogiston* only that burns and produces Flame; it dwells in sulphureous Bodies, and unctuous Earths, in Pitch, Rosin, Wax, and Oils, and in the Fat of Animals: But the finest exists in ardent Spirits, which when brought to that surprizing Subtilty, as that Liquor described by Dr Frobenius*, do truly deserve the Name of *Aether*.

Observations on
the Phosphorus.

I. From what hath been said, we see that the *Saponaceous Magma* of Urine has great Affinity with common Sulphur, being a sulphureous

Body, composed of an acid and depurated Oil, joined with a small Proportion of Earth.

II. Our *Phosphoreal Magma* comes very near *Homburg's Pyrophorus*, which wants only the Salt of Urine in it, in the Room of which *Alum* is used to fix the Sulphur.

III. We may observe hence, that urinous Particles exist in greater Abundance in Animals; but the *Phlogiston* abounds most in Vegetables, from which is prepared that fine *Æthereal Spirit* shewn by Dr *Frobenius*.

IV. We produce the *Phlogiston* out of fat Substances, and from the *Phlogiston* a *Fulligo*, or Soot, and from the *Fulligo* an urinous Salt.

V. From the corrosive Oil of Sulphur, we have a pure subtile Oil, which is intimately combined with it, and is the actual Fire of the *Phosphorus*, that by barely rubbing, or the least Degree of Heat, is kindled into Flame.

VI. He who knows perfectly the Method of making *Phosphorus*, can choose whether he will sublime his *Magma* of Urine into *Phosphorus*, or into Sulphur; for the Difference consists only in the *Encheiresis*.

3. Dr *Frobenius* being dead, and some learned Chemists at *Paris*, in Germany, and in *Italy*, having endeavoured, in various Manners, and with different Contrivances, to make this *Æthereal Spirit*; I thought it would be acceptable to the Curious in *England*, to give them an Abstract of the three Papers the Doctor communicated to the *Royal Society* concerning his *Spiritus Vini Æthereus*. The first he gave in on Feb. 19, 1729-30, along with what is printed in Vol. VII. but was desired by the Author not to be published at that Time. In this Paper he says, you must "take of Oil of Vitriol, and the highest rectified Spirit of Wine, equal Parts by Weight, not by Measure: That the Oil of Vitriol was to be poured by little and little into the Spirit of Wine, because they will grow hot upon mixing; that they should be shaken often, that they may mix thoroughly; then to be digested gently in a Glass Retort, and a large Receiver to be applied and luted on, lest the subtile Spirits should fly away: Then distil them in an *Albanor*, in gentle Digestion, for 3 Days; and pour back the distilled Liquor, till the Liquor in the Recipient appears double, or of two Sorts. Thus far he says Sir *I. Newton* was acquainted with the Process*."

He then proceeds almost in the very Words of the late Mr *Godfrey [Hanckewitz]* as printed in the *Transaction* quoted above.

He concludes, by telling us, that the first Part of the Process, till one comes to the Separation of the two Liquors is mentioned by *Canevari*, in his Book *de Atramentis*, first printed at *Venice*, and after-

Abstracts of the original Papers communicated to the R. S. by Sigismund Augustus Frobenius, M. D. concerning his Spiritus Vini Æthereus. Collected by C. Mortimer, M. D. Secr. R. S. No. 46r. p. 864. Aug. 1741.

* So long ago as the Time of *Raymund Lully* this Process was in Use: See his *Epist. accuratiora*, p. 327, and *Weidenfeld's Secrets of the Adepts*, p. 251.

wards at *London*; then by the great Mr *Boyle*; afterwards by Sir *I. Newton*: That Dr *Stahl*, and Professor *Hoffmann*, were the first in *Germany* who knew the first Operation from *Kunckel*; but neither of them brought it to Perfection, or knew the Effects of it*. In *France* M. *Hombert* undertook an Experiment somewhat analogous to this, with Sulphur and Oil.

The second Paper was communicated on the 12th of *February*, 1740-1, in *Latin*, and contains an ample Account of the whole Process, with Improvements and Additions: But as the Author in his third Paper, given in *Feb.* 19, 1740-1, in *English*, says, that that is the truest and most advantageous Process, I shall present it to the Reader as follows, only subjoining the Differences and Additions in the second Paper by Way of Note or Explication.

Take lb iv. in Weight of the best Oil of Vitriol, and as much in Weight (not Measure) of the best *Alcohol*, or the highest rectified Spirit of Wine.

1. First, pour the *Alcohol* into a chosen Glass Retort; then pour in, by little and little, 3j of Oil of Vitriol; then shake the Retort till the two Liquors are thoroughly mixed, when the Retort will begin to grow warm; then pour in more of the Spirit of Vitriol, and shake it again; then the Retort will become very hot. Do not pour in the Spirit of Vitriol too fast, or too much at a Time, lest the Glass Retort, by being heated too suddenly, should burst: You must allow about an Hour's Time for pouring in the Spirit of Vitriol, not pouring in above an Ounce at a Time, and always shaking the Retort, till the whole Quantity of the ponderous mineral Spirit is intimately united with the light inflammable vinous Spirit.

2. In the next Place, examine with your Hand the Heat of the Glass Retort, and have a Furnace ready, with the Sand in the Iron Pot, heated exactly to the same Degree as the Retort has acquired by the Mixture of the two Liquors: Take out some of the Sand, and, having placed your Retort in the Middle of the Iron Pot, put in the hot Sand again round the Retort, and apply a capacious Receiver to it; set it into cold Water, and wrap it over with double Flannel dipped in cold Water.

Raise your Fire gradually †, that the Drops may fall so fast, that you may count 5 or 6 between each, and that, beside this quick Discharge of the Drops, the upper Hemisphere of your Receiver appear also

* But Baron
Frobenius learned it of him.

at *Vienna*, knew the whole Process; and it is said Fro-

† Force it from the Beginning with a pretty strong Fire, that not only the Spirit of Wine be carried over, but the Oil of Vitriol along with it; which will most certainly happen, if a middle Degree of Heat be kept up, between a reverberatory Heat, and the other Degrees of Fire: For the Spirit of Wine being mixed with the vitriolic Acid in equal Weight, but by unequal Measure, the Spirit taking up double the Room of the Oil, does in a wonderful Manner make up the Deficiency of the highest Degree of Heat.

ways filled with a white Mist or Fumes: Continue this Heat as long as they emit the Scent of true Marjoram *.

As soon as the Smell changes to an Acid, suffocating one like that of Brimstone, take out the Fire, and lift the Retort out of the Sand, and change the Receiver; for all that arises afterwards is only a mere Gas of Brimstone, and of no Use †.

If you do not use the greatest Precaution, the Liquors in the Retort will run over; the Fire must cease as soon as the æthereal Spirits are gone over; for there remains behind an *Oleum Vini*, which is extracted by the Force of the Acid out of the Spirits, which will arise, run over, and often cause Explosions ‖.

The second Day, when your Glass is cold, infuse the Remainder, with half as much *Alcohol* †; and distil again as before, and you will have the same: The third Day again with as much, and proceed as at first, it gives it again. Go on as long as you can obtain any (of the æthereal Spirit) till all turns to a *Carbo*: Then separate it, and *alcalize* it with Spirits of *Salt Armoniac* made without Spirits of Wine, till all Effervescence ceases, and distil it once more *è Balneo Mariae*: So is it ready for Experiments **.

The

* Towards the End, the Scent will more resemble that of *Arrack*; continue this Heat for about 3 Hours, till the Scent becomes offensive, and like that of *Gas Sulphuris*.

† At this Time you will see black Froth arising, which will certainly burst your Glasses, and destroy your Work if continued.

‖ The Retort with it's Receiver being removed, set them by in a cold Place; and when all are thoroughly cold, separate the Receiver from the Retort: There will be two different Liquors in the Receiver, which pour off through a Glass Funnel into a Glass Bottle, which stop up very carefully.

The Liquor will be of two Sorts; that which swims at Top, inflammable, of the Nature $\tau\acute{\epsilon}\phi\lambda\omicron\gamma\iota\varsigma$; that which sinks to the Bottom, like *Gas Sulphuris*, a sulphureous Acid. Separate the one Liquor from the other, by the separating Funnel (*per Tritoreum*).

† I suppose he means, pour in half as much fresh *Alcohol*, as you did at first, that is, two Pounds Weight, to the Liquor remaining in the Retort.

** N. B. The above-mentioned Liquors are to be purified from the strong-smelling Sulphur, and superfluous Acid, which is performed in the following Manner:

Pour the Liquor, which swam at Top, into a Phial; drop into it, Drop by Drop successively, a sufficient Quantity of Spirit of *Sal Armoniac*, prepared either from Salt Armoniac with Quick-lime, or from Salt Armoniac and Salt of Tartar, with common Water, and not with Spirit of Wine: Every Operator knows the Quantity, *viz.* continue dropping in of such Spirit upon the Liquor of the *Phlogiston*, till all Effervescence ceases, and all the acid Taste, with the sulphureous Smell, vanishes, being precipitated by the volatile *Alkali* to the Bottom.

3dly, Let the whole Liquor be rectified in a fresh Retort by a most gentle Heat of a *Balneum Mariae*, or of an Hand as hot as that of a Person in a Fever; and then keep it for Chemical Uses.

4thly, The inferior Liquor is to be purified as well as that which swam on the Top, but it must be done by Oil of Tartar *per Deliquium*, till all Ebullition entirely ceases: By evaporating all the Humidity of this Liquor, you will have a peculiar *Terra foliata Tartari*, which, being reduced into a *Calx*, shines in the Crucible like oriental Pearls, or a Peacock's Tail. This Earth has nothing of a pungent Taste, and is to be esteemed as a Sheet-Anchor in the most ardent Fevers.

N. B.

Of Phosphorus; and Camphire of Thyme.

There are more Products to be got from this Process; as, 1st, A balsamic Oil. 2^{dly}, A *Terra foliata Tartari* of a glittering Nature, not fusible, as is the common, prepared with Wine-vinegar, and fixed Salt, which is of great Use in Medicine: And, 3^{dly}, A purple Earth out of the *Caput Mort.*

The Doctor proposed at some subsequent Meeting to exhibit four other simple *æthereal Spirits*, but of saline Origins, equally subtile with this *æthereal Spirit* of Wine.

Soon after this the Doctor died, and never discovered any Thing relating to these elementary *æthereal Liquors*; only in a Paper he left in my Hands, he gave these few Hints of their Nature.

There are 4 Spheres opened, one of the Earth, one of the Sea, one of the Air, and one of the Heaven.

Whosoever therefore knows how to extract the *Essences* out of Vitriol and Nitre, whose Centres are Salt, (and the Surface of the Earth is Salt)

1. Possesses the Salt of the Earth.
2. The Salt of the Sea is made from the Sphere of the Sea, and common Salt.
3. That of the Air is made of *Sal Ammoniac*, and Salts of Vegetables.
4. The Essence of Fire is made soon and easily from a concentrated Spirit of Wine, or of Vegetables. Thus the 4 genuine Elements of Nature are obtained.

Of Phosphorus, by M. Dufay. No. 451. p. 445. Dated Dec. 11, 1737.

Of Camphire of Thyme, by Gasp. Neuman, M. D. Prof. Chym. Berlin, and F. R. S. No. 431. p. 202. Jan. 1734.

VI. We have made at *Paris* with Success the *Phosphorus* of Kunckel, as good and as fine as that of Mr Godfrey: We made nine Drams at the first Operation.

VII. 1. Sect. 1. Some Years ago I communicated to the *Royal Society* an Observation * which appeared singular to me, and happened unexpectedly in the Distillation and Separation of the essential Oil of Thyme; for when I distilled this Oil without any Addition, there appeared a solid, dry, crystalline, white, transparent Body. I said among other Things, that this Substance, considering it's outward Form and

N. B. This Earth is of diverse Colours, but it is not the common vulgar *Terra foliata* of Tartar; for it does not flow in the Fire, nor has the same Taste as the common. The common is made by pouring distilled Vinegar upon fixed Salt of Tartar, till an entire Saturation is made. The Uses of this were formerly known, and I know not by what Fate (says the Doctor) it is coming into Use again now. I thought proper to mention the Difference of these Preparations, because I am able, from innumerable Experiments, to demonstrate a real Diversity in them. I shall seem to have dwelt too long upon one Thing, but I hope I shall be the less blamed, since I design to shew, that there are several *æthereal Liquors* besides this above-described; for there are not only such (*phlogiston*, or) combustible Fluids, but there are likewise saline Liquors, and also some quite insipid, being a Mixture of Combustibles differently graduated, and extracted by no other Heat unless their internal Fire. In a Word, as many Spheres as there are of the Elements, so many *æthereal*, or (if you rather chuse to call them so) *aereal Liquids*, viz. the *Æther* of the Earth, of the Water, of the Air, and of the Fire.

* See Vol. VII. Part iii. Chap. X. §. i.

Compo-

Composition, could not be taken for any thing but a Species of Camphire: For, as the Chymists have hitherto noted, distinguished, and denominated both natural and artificial Bodies according to their primary Qualities, I thought it could not be reduced so reasonably or conveniently to any other Substance, as to that, which has from all Antiquity been called Camphire. I enlarged this Observation of mine with such Circumstances as I judged necessary, and referred it to the Consideration of every one, that they might inform me and others also, who should be curious in this Subject. I perceived soon afterwards, that Mr Browne*, an experienced Chymist, differed from me in Opinion about this Production from Thyme, and the Name assigned to it by me; thinking the very contrary, that this dry Body emerging from the distilled Oil of Thyme, and proposed by me for a Species of Camphire, and called therefore *Camphire of Thyme*, is no Camphire, and does not deserve that Name. Therefore I shall desire Leave to explain my Meaning farther, and then leave it to any impartial Person to determine, whether it ought to be called Camphire with me, or Oil with Mr Browne.

Mr Browne says, 1. That this Production from Thyme is not Camphire, but a coagulated or condensed Oil of Thyme. Sect. 2.

2. He builds upon some Experiments, which shew a Difference between the *Indian* Official Camphire, and my Camphire of Thyme; whence he concludes, that it is not Camphire.

I said in general, in my above-mentioned Observation, that I had acquired, from our common Thyme, a true, thick, crystalli-form Camphire, agreeing in all it's Qualities, and differing only in Smell. In particular I mentioned, 1. How I obtained this Camphire. 2. Why I took this Substance for Camphire. 3. Of what Parts Camphire consists. And, lastly, that I esteem this Camphire of Thyme to agree in all it's chief Qualities, except Smell, with common Camphire. Sect. 3.

Mr Browne confesses, indeed, the Existence of this Production, saying he had seen such a Thing before, which I do not deny, though, during my 5 Years Stay in *England*; I never saw it, or heard of it; so he allows the outward Form, and disputes only the Name, contending, that it ought not to be called Camphire. Sect. 4.

But I was induced to refer this Preparation of Thyme to no other Substance than Camphire, by the following Reasons. Sect. 5.

1. It proceeds from an essential Oil.
2. It is a white, transparent, crystalline, hard, dry, friable, strong-smelling Body.
3. It will not by any Means dissolve in Water.
4. On the contrary it dissolves easily in rectified Spirit of Wine, and Spirit of Nitre.
5. The demonstrable constitutive Parts of this Production of Thyme are the same as in common Camphire, though with regard to it's specific Smell, the Proportion of it's constituent Parts, and the native

Place

Place or Climate, there is a notable Difference, and thence various subtle Differences about Mixtures and Relations, with other Things, may arise.

6. In the last Place, a Body thus constituted could not have a Name assigned to it more convenient than Camphire, of all the natural and artificial *Species*, about which Chymistry is concerned; for this Substance is neither a volatile nor fixed Salt, nor an Earth, nor a Stone, nor a condensed Juice, nor a Bitumen, nor a Gum, nor a Resin, nor a Sulphur, nor Flowers, nor a Precipitate, nor a Sublimate, nor Pitch, nor Wax, nor *Phosphorus*, nor Glass, nor Ice, nor Gravel. Much less could I call this hard, dry, crystalline Body by the Name of any thing unctuous, and least of all of any thing fat, or oily, or liquid; seeing it is neither a Balsam, nor a Liniment, nor a *Coagulum*, nor Butter, nor Oil, nor Fat, nor Spirit, nor Water, Tear, Wine, Liquor, Vinegar, or any thing of that Sort. Thus I have never yet been able to think of any thing more convenient than Camphire, to which I could better compare it, or by the Name of which I could more justly express it.

Sect. 6.

With regard to these, and an Account of the Properties just now described, I was led to call these elegant, white, dry, pellucid, solid, friable, fragrant Crystals, obtained from distilled Oil, and dissolving in rectified Spirit of Wine, and Spirit of Nitre, but not in Water, by the Name of Camphire, and so distinguish it from the common and other *Species*, by the Name of Camphire of Thyme; and I affirmed at the same Time, that it agreed with the Official *Indian* Camphire in all these Properties, though at that Time I made no Mention of all and every Affection, Affinity, Effect, Distinction, and Sub-division, especially as I had not then acquired any great Quantity of it, sufficient to make the necessary Experiments, not to mention, that the *European* Vegetables, which seem naturally to yield this Camphire-like Substance, have hitherto afforded but very little of it. Now who can think that these excellent Properties of this Production of our Thyme, which I have briefly enumerated, do not agree with the common Camphire? And how could I have given this Substance a more convenient and suitable Name than that of Camphire, to assign it's proper Character, and at the same Time to distinguish it from all other Bodies now known in the World?

Sect. 7.

Mr *Browne* must excuse me, if I cannot give the Name of Oil to such white, pellucid, dry, solid Crystals, which even sound when shaken together; and though he attempts to guard himself by adding the Epithets *coagulated* or *condensed*, affirming it to be a coagulated and condensed Oil, yet this is not sufficient for his Purpose, since such Oils appear in quite another State, and are found to be quite other Things in Chymistry, as I shall presently demonstrate.

Sect. 8.

In the first Place, Mr *Browne* affirms, that these Crystals of Thyme, which I have called Camphire, and do still call so, are an Oil; but I

am

am hindered from agreeing with this Gentleman by the following Circumstances.

These Crystals are dry to the Touch, and so not soft, or unctuous, or fat, but quite crystalline and divided, which Properties alone would be sufficient to reject the Appellation of Oil; for the Nature of Oil is diametrically opposite, and the Name of Oil is never applied to such a dry and crystalline Substance, or justly to any thing but what is liquid, fat, or at least of an unctuous Substance like Butter.

Secondly, he endeavours to support the Proof of this Character, by adding the Epithet *coagulated*: But I must beg Leave to tell him, that this is not sufficient.

1. Because in all Chymistry the Epithet *coagulated* never can nor ought to be ascribed to such a Substance as is quite dry and crystalline, and consequently neither unctuous nor crystalline. On the contrary,

2. It is to be ascribed only to such Things and Circumstances, in which it collects something by precipitating itself in a Manner, and assumes a Consistence like curdled Milk, or *Offa alba Helmontii*, or Rob, or Butter, or Ointment. So long as the Name *Coagulum*, or *coagulated*, is ascribed to it, it cannot be dry, but must either be moist and fat, or Resino-viscous, or unctuous. And if we should grant, that this Word may or ought to be wrested to Things of a dry Consistence, though this has not yet been introduced in Chymistry, this at least must be allowed, that it can never be extended to a pellucid, crystalline Body, consisting in separate, perspicuous, dry Pieces, composed in Order, appearing like a crystalline Salt, and hard even to crackling; and therefore such a Substance can never be called a *Coagulum*, or coagulated Oil, which has never yet been received or heard of.

3. All coagulated Oils, as Oil of Anise, Rue, Olives, &c. if they are ever so much coagulated by Cold, never become dry, hard Crystals, like vitriolated Tartar, or larger, like Sugar-Candy, or Crackling, or Sounding, but at most appear like very thin Leaves, and grease the Fingers, being generally of a Consistence like Butter, but never degenerate into such a Hardness as to represent Camphire.

4. Coagulated Oils, with a small Degree of Heat, grow liquid again, and lose their State of Coagulation, which is not the Case with our Crystals, which retain their solid Form in Summer as well as in Winter, and even when a gentle Heat is purposely applied.

In the third Place, Mr Browne uses the Word *condensed*, for he calls Sect. 10, the Crystals a coagulated or *condensed* Oil. If he had said the Crystals are a Body condensed from Oil, he had not dissented from what I said in my Observation. But when he takes them merely for Oil, I cannot agree with him; for it is one Thing to say it is condensed or separated from Oil, and another to call it a condensed or coagulated Oil: For this last Form of Words expresses an entire Oil; but the former something separated, newly produced, proceeding from Oil, and appearing quite otherwise than the remaining Oil. That Oil, which suffers itself

to be coagulated or condensed, is so only in a hundredth, fiftieth, or twentieth Part; but such an Oil ought to coagulate and condense itself through and through, if not in the Whole, yet in the greatest Part of it's Weight. But how comes it, that here in the Oil of Thyme, only a small Weight of these elegant Crystals is separated, and all the rest of the Oil shews not the least Alteration or Sign of Coagulation or Condensation, but remains equally in a perfect liquid and oily Consistence? The Substance, out of which any Body is formed, is one Thing, and the Body so formed is another. In the Substance in Question there is Oil at the Beginning, and that a distilled, essential Oil; but after a new Substance is separated from this Oil, which does not agree with the Oil, either as to Touch, Sight, or external Appearance, I cannot persuade myself to take this now clear, transparent, white, solid, crystalline Body, for the former reddish, thin, and liquid Oil: Much less can I take this Substance for a coagulated or condensed Oil, though it is separated and condensed, or rather crystallized from Oil. But if this Method were to prevail of calling Bodies, separated and prepared from this or that Subject, by the Name of the Subject from which they are separated, wonderful Conclusions and astonishing Confusions would arise in Chymistry; and so in Relations and Descriptions of artificial Things there would be produced hardly any Thing but an equivocal, obscure, and uncertain Sense. If from this Reason only Camphire was to obtain the Name of Oil, because it proceeds from Oil, and was to have only the Epithet *coagulated* or *condensed* added to it, on account of it's Consistence and Figure, and so I could at once free myself from all Objections, when I might justly call the common Spirit drawn from Corn, *liquid Corn*, or *liquid Seed*, *rarefied Barley*, *spirituous Wheat*, and so on, because it is prepared from those Seeds. Thus I might call Flowers of Antimony, *volatile Antimony*; Spirit of Sulphur, *aqueous Sulphur*; Phosphorus, *coagulated Urine*; crystalline lixivious Salt, *condensed Ashes*; and so many Substances might be denominated with Prolixity.

But if I can express any Substance by one characteristic Word, why should I avoid that, and make Use of two or more, and so instead of the single Word *Camphire*, use *coagulated*, or *condensed Oil*? It is easily understood, that when I say Camphire, I mean a crystalline and condensed Body; nay, condensed from Oil, and for the most Part consisting of oily Parts. Besides there are different Methods in Chymistry, by which a dry Body is obtained from a liquid Substance, which ought all to be well distinguished, and not called promiscuously coagulated, or condensed; for there is no small Difference between coagulated and crystallized, between congealed, condensed, inspissated, precipitated, sublimated, and other such like Methods.

These are my Reasons for calling these Crystals, obtained from Oil of Thyme, *Camphire*, and not *Oil*, or by any other Name. As for Mr Browne, and other Gentlemen, they may call them *Oil*, or *volatile Salt*, or whatsoever they please.

Besides I am neither the first nor the only one who has given the Name of Camphire to such a Body obtained from the *European* essential Oils. To avoid Prolixity, I shall mention only two, whom Mr *Browne* himself has quoted. Sect. 12.

1. The learned and famous *Leyden* Professor, Dr *Boerhaave*, in his *Chymiae Institutiones & Experimenta*, says, that Camphire "is not only the Produce of the Camphire-Tree, but that all aromatic Plants may produce a Camphire *sui generis*." The same Author has farther explained his Mind in his Courses and Lectures, as to the *European* Oils from which Camphire may be obtained. 2. That learned and experienced *Parisian* Chymist, M. *Geoffrey*, junior, says*, that "the Oil of Turpentine, though rectified with Water, deposits on the Sides of the Bottle some Crystals resembling the Needles of sublimed Camphire. I have observed the same Thing in the Essences of Feverfew, Marjoram, &c." And again, "The Oils of Sage and Rosemary, for Example, acquire almost the same Smell when they grow old. Some even approach to the Smell of Camphire. If I had some Sage Water, which being kept above a Year, had acquired a very strong Smell of Camphire, so that one might have taken it for Water, in which Camphire had been quenched." But as Mr *Browne* refuses to accept of the Experiments and Relations of these great Men, and seems to doubt of them, he will much less assent to others, from which it has appeared, that Camphire has been obtained not only from various Vegetables of the *East-Indies*, besides that which is properly called the Camphire-Tree, as from the Root of the Cinnamon-Tree, from Zedoary, the Mint of *Ceylon*, and from the *Schoenanthus*, Southernwood, Yarrow, Cardamom, Juniper, &c. of the same Country; but also from the Sage, Rosemary, Marjoram, Hyssop, &c. of *Europe*, besides Thyme: For though Mr *Browne* uses the following Words, "But I do not remember to have seen any Thing of this Kind in other Oils, except the Oil of Thyme, only in the upper Part of Oil of Mace something of a crystalline Form seems to fluctuate, but what Kind of Substance it is, whether Camphire or not, Time will shew." Yet other People have often seen and observed such a Thing, and so it is no Argument, that because Mr *Browne* has not yet seen it, therefore no-body else ever saw it, or no such Thing ever did or can happen, much less that every Thing is false, which Mr *Browne* has not seen, or does not like. He confesses indeed, in his Postscript, that Mr *Maud* had shewn him some Camphire of Marjoram; but because this, as well as the Camphire of Thyme, does not agree in every particular with common Camphire, he does not allow it to be Camphire, but a coagulated Oil.

Mr *Browne* seems sometimes to doubt of his Opinion, that the Camphire of Thyme is a coagulated Oil: For he says in one Place, "As for this Salt, or coagulated Oil of Thyme, &c." and in another, Sect. 13.

* Mem. de l'Acad. An. 1721.

“ It will not be foreign to the Purpose, to add some Testimonies concerning coagulated Oils, or *Salts* proceeding from Oils.” Hence it appears, that, when he calls the Crystals in Question *Salt* or *Oil*, *coagulated Oil*, or *Salt* proceeding from *Oil*, he is not certain or uniform in his Opinion, that these Crystals are nothing but *Oil*, but thinks, perhaps, that they are as much a *Salt* as an *Oil*, though not far from the Beginning of his Treatise he denies them the Name of *Salt*, saying, they have hitherto been *improperly* called volatile *Salt* of *Thyme*. These doubtful Thoughts about *Salt* occur not only in the 2 Passages quoted above, where the Words *Salt* or *Oil* may seem to have slipped from him by Chance, but may be more clearly collected, when he quotes 3 learned Men, *Slare*, *Helmont*, and *Boerhaave*; that the venerable Dr *Slare* called the Camphire of *Thyme* a volatile *Salt*, (though he allows that it does not dissolve in *Water*, by which Characteristic alone it is evidently not a *Salt*) also that a Precipitation of *Salt* had been observed in *Oil* of *Cinnamon*; which however could be nothing else but *Camphire*, because he himself adds, that this *Oil* had been distilled without any Addition or Art to make it take upon itself the Form of *Salt*. The other Examples quoted from *Helmont* and *Boerhaave*, in Confirmation of this native, volatile *Salt*, resembling *Camphire*, do not suit his Purpose, for these two speak of a quite different and real *Salt*, an artificial, volatile *Salt* made of *Oil*, and a fixed alkaline *Salt*, as Mr *Browne* himself quotes them, and he ought to have considered it, for he says thus: *Helmont* has spoken of a *Salt* prepared by Art from the same *Oil*: “ But when *Oil* of *Cinnamon* is mixed with it's alkaline *Salt*, &c.” And thus also that *Salt* or *Soap* (as Dr *Boerhaave* calls it) alledged by *Boerhaave* from *Homburg's* Experiment, must necessarily have been some volatile *Salt*, mixed with some naked alkaline *Salt*, if it was really dissolvable in *Water*; but if it put itself in the Form of *Salt*, without any Addition, it was certainly nothing but *Camphire*, and consequently was not dissolvable in *Water*, nor capable of being mixed with it, whence *Boerhaave* adds, we cannot easily imitate the Experiment, that is, if we would obtain volatile *Salt* dissolvable in *Water*, or *Soap*, without any Addition.

Sect. 14.

In my former Observation I gave a Definition or Description of the Composition of *Camphire*, or of it's constituent Parts, that it consisted, 1. of an inflammable and fiery Principle, or rarefied *Phlogiston*, that is, of a subtile, sulphureous Substance, which Principle some call simply *Sulphur*, in a large Sense, and others, as *Beccher* and *Stahl*, a sulphureous, inflammable Earth; a second, ignescible and phlogistic Earth, and commonly in one Word *φλογιστόν*, where I used these Words, *constat rarefacto phlogisto*, or as it is in my Manuscript, *constat ex rarefacto phlogisto*; and I put this Constituent in the first Place, because, as to Quantity, it constitutes the greatest Part in the Proportion of the Composition. Though indeed I might have said instead of it, *Camphire* consists in the first Place of *Oil*, or oily Particles, for this I chiefly intended, but in

in this Place, for certain Reasons, I would not make Use of that Expression, because I gave the Description only in a physical Sense, as to the Principles, for Oil consists of an inflammable Principle, Water, and Earth; and therefore never so much as dreamed of any equivocal Explanation, being fully persuaded, that this chymical Form of speaking, *ex quo quid constat*, or *what constituent Parts any Thing contains*, was well understood by every Body, especially by a Chymist. If I am not mistaken, when the *English* would render it *consists* into *Latin*, they use the Verb *constat* before an ablative Case, either with or without the Preposition *ex*: And this Way of speaking is commonly to be found in all the Books of Chymistry. But Mr Browne is pleased to explain, not to say wrest these three Words *constat rarefactio phlogisto* to another Sense, as if I had said it was *in igne constans*, or that it resisted the Fire, which never entered into my Imagination. It appears however from this wrong Interpretation, that Mr Browne has not yet read the Works of our great and excellent Chymist Stahl, and therefore has not a right Understanding of the Word *φλογιστον*, which is so usual an Expression with him.

At length I come to consider the Differences observed by Mr Browne Sect. 15. between Camphire of Thyme, and common Camphire, of which he produced several. These no Doubt induced him to believe and to write publicly, that this crystalline Substance, obtained from the Oil of Thyme, is not Camphire, because, on being mixed with other Things, it would have a quite different Effect.

For my Part, I do not doubt in the least of the Truth of these Observations, and readily allow, that if the Camphire of Thyme is to be extended so far according to other Relations, and with regard to other Bodies, it will differ notably from common Camphire; and so in this Point I shall join Hands with Mr Browne, without any Contradiction. But I had no Intention of extending it so far, but only thought of the principal and most obvious Properties, by which common Camphire and Camphire of Thyme are distinguished from all other Compounds, being not at all solicitous about all the other Differences and particular Qualities; nor, as I said before, could I set about farther Inquiries, with so small a Quantity as I had obtained.

The Reasons which induced me to rank the Camphire of Thyme Sect. 16. with the Official Camphire, were the following: 1. The Camphire of Thyme proceeds from an essential Oil. 2. It is a solid Body. 3. It is friable, though Mr Browne denies this Property, which I can demonstrate in my Crystals. 4. It is white. 5. It is clear and transparent. 6. It consists of divided Crystals. 7. It has the Smell of it's proper Oil. 8. It will not dissolve in Water. 9. It is easily dissolved in rectified Spirit of Wine. 10. It is dissolved by Spirit of Nitre, in all which Properties it agrees with the Official Camphire.

I should have thought, that it's Agreement in so many Circumstances might have been sufficient, without any farther Consideration, to give it the Name of Camphire.

I men-

Of Camphire of Thyme.

I mentioned one general Difference, that there was a much greater Quantity of Camphire than of Oil obtained from the Camphire-Tree, whereas on the contrary the *European* Vegetables afford a great deal of Oil, but very little Camphire; to which I now add, because the *European* Camphires consist of much Oil, and a small Portion of Camphire, and so these Camphires are much more oily in their Composition, even with respect to the *East-Indian* Camphire, seeing they are supersaturated with oily Parts, and therefore not so firmly united with other Parts, but the Official Camphire, in Proportion to it's Ingredients, has fewer oily and more terrestrial Parts, and all it's constituent Parts are better and more firmly mixed; and therefore a notable Difference may easily be found between them, in their Mixture with other Liquors, with regard also to their Sublimation, Solution with Oil of Vitriol, Exhalation, Precipitation, &c. But we are not therefore to conclude, that because the Camphire of Thyme does not agree in every individual Respect with common Camphire, it is therefore not a Camphire: For if in Chymistry we were to have Regard only to particular, different Relations, and not attend to the more general and observable Properties, but to look upon them superficially, and draw our Conclusions from the former, very few Things could be brought together, and many of them would often run into a too prolix and incoherent Judgment.

I shall exemplify what I have said only from Metals and Salts.

Every one knows, that Gold, Silver, Copper, Iron, Tin, and Lead, are esteemed perfect Metals, and Quicksilver a Semi-metal, or imperfect Metal, because these Substances possess the chief Properties of the same Thing, which is called *Metal*, and therefore cannot be compared to Stones, Earths, Sulphurs, Bitumens, Salts, or to any Thing else in the whole World, except Metals; in like Manner as the Camphire of Thyme, according to the above-mentioned Properties, cannot more easily be compared to any Thing than to Camphire. But according to Mr *Browne's* Way of reasoning, we must not give the Name of *Metal* to all the above-mentioned Bodies, because they do not agree in all Respects, and Mixtures with other Things, in Solutions, Precipitations, Sublimations, &c.

Suppose I take Gold to be a Metal, because it is dissolved in *Aqua regia*; then I must not call Silver a Metal, because it is not dissolved in *Aqua regia*.

On the other Side, if I take Silver and some other Metals to be true Metals, which are dissolved in *Aqua fortis*, I must exclude Gold from being a Metal, because it is not dissolved in *Aqua fortis*. Spirit of Vitriol dissolves Iron and Copper, but not Gold or Silver, and therefore these two most noble Metals will not be looked upon as Metals.

This is just such another Argument as Mr *Browne* makes use of with regard to the Solubility of Camphire of Thyme, when he says, that Oil of Vitriol dissolves common Camphire, but not Camphire of Thyme, and therefore this Preparation is no Camphire.

He might form an Objection, with regard to the Differences of Colour, and Consistence in Solutions, for Spirit of Nitre dissolves some Metals with a white Colour, and the Solution appears transparent and clear; but because the Solution of Copper is of a bluish Green, that of Iron of a very dark, reddish Brown, that of Tin not quite transparent, and all these different from the Solution of pure Silver, Quicksilver, &c. therefore that, as these appear thick, or at least not transparent, they are not Solutions of Metals, or that the dissolved Substances are not Metals.

For so Mr *Browne* determines with regard to the Solution of Camphire of Thyme in Spirit of Nitre: Because the Solution of Camphire of Thyme has not the same Colour, Consistence, and Transparence as the Solution of common Camphire, therefore Camphire of Thyme is not a Camphire; not considering, that there is a Difference also in the different Solutions of Metals in Spirit of Nitre, and that this Camphire of Thyme, proceeding from a dark, red Oil, super-saturated with oily Parts, must therefore necessarily produce a more dark and thick Solution.

With regard to Precipitation, or other Relations of these Solutions Sect. 19. even by themselves, Mr *Browne* might make many Objections, as there are many more Differences between them than between these 2 Camphires.

With regard to a farther Relation of the Solution of Metals, any one might object: The Solution of Silver, Lead, and Quicksilver in Spirit of Nitre affords true Crystals; on the contrary, the Solution of Iron and Tin in Spirit of Nitre makes none; therefore these last are not Metals, but only the first. The Solution of Quicksilver in the concentrated Acid of common Salt by Sublimation affords a crystalline Salt, which other Metals do not; therefore only Quicksilver is a Metal. Some Metals emit a strong Vapour in Solution, and others not. Some make a Precipitation when they are dissolved, and others not; therefore some only are Metals, excluding the rest.

With regard to Precipitation, no small Number of Differences in the Solutions of Metals might be produced; for sometimes we precipitate the dissolved Metal in Form of a pure metallic Calx, at other Times the Precipitation is without the least metallic Splendour. But then who would assert, that the last do not proceed from Metals as well as the first? And yet Mr *Browne*, observing that the Solution of Camphire of Thyme does not precipitate in the same Manner as that of common Camphire, concludes, that it is not a Species of Camphire.

There are innumerable Differences also in the Copulations, Solutions, Sect. 20. Precipitations, Sublimations, and Crystallizations of Salts. How greatly do acid Salts differ from one another? and also when they are joined with an alkaline Salt, either fixt or volatile, and reduced to a neutral State? But if any one was to argue from these Differences among Salts, that one or other of them is not a Salt, that Way of reasoning would hardly be admitted.

Of Camphire of Thyme.

Now Camphire of Thyme possesses 9 or 10 principal Properties, which agree with common Camphire, as I have mentioned already, and Mr *Browne* neither can nor dares deny it. And most certainly I could not compare this white, solid, transparent, fragrant, inflammable, crystalline Body with any one Thing in the World but Camphire. Thus also Lead, Iron, Copper, and Tin, cannot be referred to any Thing so properly as to Metals; nor can Vitriol, common Salt, Allum, and Nitre be reduced to any Thing so well as to Salts, because they agree with them in their most remarkable Properties, and with nothing else so well. But, according to Mr *Browne's* Way of reasoning, it might be objected, that Lead, Iron, Copper, and Tin, are not Metals, because they do not endure the Fire like Gold and Silver, but are burnt to a *Calx*, partly evaporate, and differ in Solution, Precipitation, Sublimation, &c. that Vitriol, common Salt, Allum, and Nitre are not Salts, because they greatly differ from a pure, acid, or alkaline Salt, or a sublimable, ammoniacal Salt, and so on the contrary. I believe Mr *Browne* himself would have no Doubt in this Case. But if he knows, and firmly believes, that the 4 above-mentioned mineral Substances are Metals, though they differ much from Gold and Silver; and that those saline Substances are true Salts, though they are neither pure, acid, nor alkaline Salts, and differ very much from many other Salts, and from one another also; why then does he introduce a new Way of judging in the vegetable Kingdom, and refuse to acknowledge the Camphire of Thyme to be a Species of Camphire, because of some Differences between it and the common Camphire, though it agrees with it in it's principal Properties, as the above-mentioned Metals and Salts do with the other Metals, and the other Salts.

Sect. 22.

By Way of Conclusion I repeat once more,

1. That whatsoever deserves the Name of Oil, ought to be either liquid, or at least unctuous and fat to the Touch.

2. That when any Thing is esteemed to be a coagulated or condensed Oil, it must necessarily be thick, and not liquid, or at most of the Consistence of an Ointment or Suet, and that only in the Cold; and then it must not grease the Fingers, and upon the Application of the least Heat, must lose it's coagulated Form again.

3. But as soon as I obtain dry, solid, and transparent Crystals, in Form of fine, clear, crystallized, vitriolated Tartar, though they proceeded from Oil; nay, though the Body, which afforded them, consisted chiefly of oily Parts, yet the Title of Oil ceases immediately, and it can no longer retain the Title of coagulated or condensed Oil; nor is it necessary to make use of such Appellations, for if such a crystalline Production from essential Oil appears to be a dry Body, as we see the Substance in Question is, the single Word *Camphire* is then sufficient, and so best of all expresses what Sort of a compound it is, and that it is nothing but a Species of Camphire; and thus our Crystal-like Body is

CAMPHIRE OF THYME.

Berlin, March 5, 1731.

2. I freely acknowledge, that, in my second Dissertation concerning *Campfire of Thyme*, I did not intend to affirm any Thing more, than that the Substance, which appears in hard Crystals, not dissolvable in Water; obtained from Oil of Thyme, and some other essential Oils, is not any volatile Salt, much less a coagulated Oil, but a particular Substance, separated and concreted from those Oils, and, in a few Words, a Body of such a Nature, that I cannot give it a more convenient Name than that of *CAMPFIRE*.

Extract of a Letter from the same Author to the President of the R. S. Dated Ap. 11, 1733. Ibid. P. 231.

VIII. It is a *Tartarum solubile*, composed of Cream, or Crystals of *Tartar*; and the fixed Salt of the *Kali* of *Alicante* well depurated. This Salt is very singular; for though it be a fixed *Alcaline* Salt, it has the peculiar Property of crystallizing; nor does it easily dissolve in the open Air, as other fixed Salts do; but, on the contrary, it calcines therein, like *Vitriols* or *Glauber's Salt*. Another peculiar Property, which I have observed to belong to it, is, that if it be satiated with a *vitriolick Acid*, and the Liquor be evaporated, there results a Salt that has the Form of *Glauber's Salt*, and all the Properties requisite to make *M. Seignette's Salt*. In order to which,

Concerning Mr. Seignette's Sal Polychrestus Rupellensis, and some other Chemical Salts. By M. Geoffroy, Chemist, Member of the R. Acad. of Sciences at Paris, & F.R.S. Dated Paris, May 4, 1732. No. 436. p. 37. Jan. & c. 1735.

Take of the Salt of *Kali*, well purified, 1℔. dissolve it in Water, add thereto of *Crystals of Tartar* about 1℔. ℞; boil the whole in order to dissolve the *Crystals of Tartar*: But the exact Proportion of *Crystals of Tartar* can be no more determined in this Operation, than in making the *Tartarum solubile*; either because the Salt of *Kali* has retained more or less Humidity in its Crystallization, or because the *Tartar* has more or less Impurities in it. But if there be too much *Tartar* in the alkaline Liquor, after the Fermentation is over, filtrate the Liquor, and as it cools, the superfluous *Tartar* will fall to the Bottom. After the Separation of the *Tartar* from the Liquor, evaporate the *Lixivium* by a gentle Heat, set it in a cool Place to crystallize, and you will have very fine *Crystals*. If the Liquor be evaporated a little too much, there will be no *Crystals* of Salt formed, but the Liquor will be converted into a hard, transparent Mass, not unlike Glue. But if you dissolve this Mass again, you may make it crystallize, as upon dissolving *Seignette's Salt*.

This Salt purges very well, from one to two Ounces dissolved in a Quart of Water.

Such is the Discovery of this Salt, which has hitherto passed for an *Arcanum*.

We have likewise his crystallized, alkaline Salt, which is the Salt of *Kali*, that dissolves not in the Air. I am actually at work in perfecting this Salt, in examining that of *Kali*, and comparing it with *Borax*. From this last I extract *Glauber's Salt*, by mixing it with Oil of *Vitriol*. The Mixture of *Borax* ℥iv, with Oil of *Vitriol*, 3j 3j upon Sublimation gives me the *Sal sedativum* described by *M. Homberg*; and the Residue exposed to a strong Fire affords *Glauber's Salt*. I have found

out a Method to shorten this Operation; for instead of subliming this Salt, I get it by Crystallization in light, foliated *Laminae*. This Salt, whether sublimated or crystallized, has the Property of dissolving in Spirit of Wine; and if you set this Spirit of Wine on Fire, it's Flame is green. Spirit of Wine has no Effect on *Borax*; the Oil of *Vitriol*, digested with Spirit of Wine, communicates no Greenness to it's Flame: Therefore it is requisite that the *Borax* should be united to an Acid, in order to produce this green Flame.

Postscript.

I send you a Specimen of Salt made of *Crystals of Tartar* and Lime Water, which Mess. *Grosse* and *Dubamel*, two Members of our Academy, have prepared; to which I join *Crystals of Seignette's Salt*, that M. *Bolduc* and I have made separately.

You will also find some *Sal sedativum* made by Crystallization, which crystallizes in a peculiar Manner. This Operation is performed with ℥iv of *Borax*, and ℥i ℥i of concentrated Oil of *Vitriol*, the most fixed and weighty that can be had. The *Borax* is put into a Glass Retort, the Oil of *Vitriol* is poured on it, and then half an Ounce of common Water. This Mixture being exposed to a Fire gradually increased, after the Phlegm has passed off, and even while it is passing, there rises Flowers, or a volatile Salt in very beautiful, foliated *Laminae*; some of which melt by the Heat of the Fire. After the Operation, the finest of these Flowers, which are round the Neck of the Retort, are gathered; and those that are grey, are thrown upon the remaining Mass; which Mass is dissolved in Water, filtrated, and evaporated slowly. Sometimes, even without Evaporation, the shining talcous *Laminae* are to be seen in the Liquor. In 24 Hours the Liquor is poured off these *Laminae*: They are washed in fair Water, set to drain, and then to dry in a Stove.

If these *Crystals* do not calcine in the Stove, or in the Sun, it is a Sign there is nothing crystallized but the *Sal neutrum*: If they do calcine, it is a Sign that there is some *Glauber's Salt* mixed. And then this Salt must be dissolved again in hot Water, and recrystallized. No-body before me has thought of extracting this Salt by Crystallization: It was always sublimed hitherto.

*An Account of
some Oil of
Sassafras crys-
tallized, by
Mr John
Maud, Che-
mist, F. R. S.
No. 450. p.
378. Oct. &c.
1738.*

IX. A few Days ago, I observed some essential Oil of *Sassafras*, which had stood exposed to a frosty Night, in an open Vessel, was changed, 3 Parts out of 4, into very beautiful, transparent Crystals, 3 or four Inches in Length, $\frac{1}{2}$ an Inch in Thickness, and of an hexagonal Form.

These Crystals subsided in Water, were indissoluble in it, inflammable in the Fire, and when exposed thereto, melted into their pristine State. Hence it is evident, that they still retain the natural Qualities of an Oil, although they appear under a different Modification of their constituent Parts. What is most remarkable herein, consists in a *Metamorphosis* from a fluid to a solid Body, of such a particular Figure, and from a yellowish Liquor (not unlike *Madera Wine*) to a very

pellucid Body, like Ice congealed from the most transparent Water. This seems to afford a new Instance of Cryftallization, which being generally accounted for by the Particles of a Fluid, or those of any other Body, fufpended by the Fluid, brought nearer by Cold, and at length coming within the Sphere of each other's Attraction, unite together into an immediate Contact. This Oil being one of the heaviest Oils, and even heavier than Water, is the more likely thus to unite, as it's Parts are nearer together. This may be a Hint to the Curious, to difcover wherein confifts the Difference of Solidity and Fluidity; and likewise fhews how much the Colour of Bodies depends on the mechanical Situation of their Parts.

X. Having feen a Ditch within 2 Miles from *Wigan* in *Lancashire*, wherein the Water would feemingly burn like Brandy, the Flame of which was fo fierce, that feveral Strangers have boiled Eggs over it; the People thereabouts indeed affirm, that about 30 Years ago it would have boiled a Piece of Beef; and that whereas much Rain formerly made it burn much fiercer, now after Rain it would fcarce burn at all. It was after a long-continued Season of Rain that I came to fee the Place, and make fome Experiments, and found accordingly, that though a lighted Paper were waved all over the Ditch, the Water would not take Fire. I then hired a Perfon to make a Dam in the Ditch, and fling out the Water, in order to try whether the Steam, which arofe from the Ditch, would then take Fire, but found it would not. I ftill, however, purfued my Experiment, and made him dig deeper; and when he had dug about the Depth of half a Yard, we found a fhelly Coal, and the Candle being then put down into the Hole, the Air caught Fire, and continued burning.

I obferved that there had formerly been Coal-pits in the fame Clofe of Ground; and I then got fome Coal from one of the Pits neareft thereunto, which I diftilled in a Retort in an open Fire. At firft there came over only *Phlegm*, afterwards a black Oil, and then likewise a Spirit arofe, which I could no Ways condense, but it forced my Lute, or broke my Glaffes. Once, when it had forced the Lute, coming clofe thereto, in order to try to repair it, I obferved that the Spirit which iffued out caught Fire at the Flame of the Candle, and continued burning with Violence as it iffued out, in a Stream, which I blew out, and lighted again, alternately, for feveral Times. I then had a Mind to try if I could fave any of this Spirit, in order to which I took a turbinated Receiver, and putting a Candle to the Pipe of the Receiver whilft the Spirit arofe, I obferved that it caught Flame, and continued burning at the End of the Pipe, though you could not difcern what fed the Flame: I then blew it out, and lighted it again feveral Times; after which I fixed a Bladder, fqueezed and void of Air, to the Pipe of the Receiver. The Oil and *Phlegm* defcended into the Receiver, but the Spirit, ftill afcending, blew up the Bladder. I then filled a good many Bladders therewith, and might have filled an inconceivable Number

An Experiment concerning the Spirit of Coals, by the late Rev. John Clayton, D.D. No. 452. p. 59. Jan. 1739.

ber more; for the Spirit continued to rise for several Hours, and filled the Bladders almost as fast as a Man could have blown them with his Mouth; and yet the Quantity of Coals I distilled were inconsiderable.

I kept this Spirit in the Bladders a considerable Time, and endeavoured several Ways to condense it, but in vain. And when I had a Mind to divert Strangers or Friends, I have frequently taken one of these Bladders, and pricking a Hole therein with a Pin, and compressing gently the Bladder near the Flame of a Candle till it once took Fire, it would then continue flaming till all the Spirit was compressed out of the Bladder; which was the more surprising, because no one could discern any Difference in the Appearance between these Bladders, and those which are filled with common Air.

But then I found, that this Spirit must be kept in good thick Bladders, as in those of an Ox, or the like; for if I filled Calves Bladders therewith, it would lose it's Inflammability in 24 Hours, though the Bladder became not relax at all.

A Chemical Experiment by Mr John Maud, serving to illustrate the Phenomenon of the inflammable Air shewn to the Royal Society by Sir James Lowther, Bart. No. 442. p. 282. July, &c. 1736.

XI. It is very well known to every one versed in Chemical Affairs, that most Metals emit great Quantities of sulphureous Vapours, during the Effervescence which they undergo in their Solutions in their respective *Menstrua*, or *Solvents*. Of these Fumes Iron emits a great Quantity whilst it is dissolving in Oil of Vitriol, which are very inflammable, and not easily to be condensed. These Fumes I collected into a Bladder with the desired Success, and having produced before the Society two Bladders of this fictitious Air, at the same Time that Sir *James Lowther* was pleased to make Trial of his, they both exhibited the same Phænomena. I shall here give a more particular Account of the Preparation made use of, which was as follows:

I took 3ij of Oil of Vitriol and mixt it with 3viij of common Water, which I put into a Glass with a flat Bottom, about ten Inches wide, and three deep, with a long Neck; to this I added 3ij of Iron Filings: There instantly arose a great Heat, with a violent Ebullition, and the Iron was wrought upon very fast, with Fumes copiously exhaling. To the End of the Neck of the Glass I luted a Bladder void of Air, the Neck of the Bladder being fastened to a Tobacco-Pipe; the Fumes arising from the dissolving Metal soon puffed up the Bladder to it's full Extent, when that being taken away, the Neck of it being first tied close with a String, I applied another in the same Manner: Thus you may get as many Bladders full as you can, whilst the Effervescence lasts. Two of these Bladders were tried before the Society, and exhibited a Flame like those of Sir *James Lowther*, very like in the Smell, though somewhat different in the Colour of the Flame. After I had pressed Part of the Air out of the Bladder, by drawing back the Hand, the Flame was sucked into the Bladder, and set on Fire what inflammable Air remained, all at once; which went off like a Gun, with a great Explosion.

What

What is worthy of Notice in this Experiment, is, that all the Air which filled the Bladders was as it were generated *de novo* out of the Mixture, or else recovered from being locked up in the Body of the Metal in an unelastic State.

This Experiment will easily explain a very probable Cause of Earthquakes, Vulcanos, and all fiery Eruptions out of the Earth; for nothing more is requisite than an Intervention of Iron with a vitriolic Acid and Water. Now Iron is generally found accompanied with Sulphur: And common Sulphur may be analysed into an inflammable Oil, and an acid Liquor like Oil of Vitriol. This Acid therefore in the Bowels of the Earth, by being diluted with a little Water, surrounds the Iron, and works upon it in the same Manner as described above; an Effervescence and intestine Heat arises; the Air which comes from the Mixture is rarefied, and becomes very elastic, it's *Impetus*, by how much the more compressed by the incumbent Weight of Earth, is increased even to an unlimited Degree, and at length, like Gunpowder, will remove all Obstacles, and will exhibit to the Spectators above Ground the terrible Phænomena of Earthquakes and Eruptions. These inflammable Fumes sometimes, if very much heated, will, as soon as they come to the open Air, catch Fire, and so produce those fiery Eruptions, of which there are so many Instances in the World.



The End of the **THIRD PART.**

THE



THE
Philosophical Transactions
ABRIDGED.

PART IV.
CONTAINING THE
Historical and Miscellaneous
PAPERS.

CHAP. I.
HISTORY and ANTIQUITIES.

Proposals for the Improvement of the History of Russia, by publishing, from Time to Time, separate Pieces to serve for a Collection of all Sorts of Memoirs, relating to the Transactions and State

I.  HE History of the Empire of *Russia* and it's Provinces and Territories incorporate, has, 'till now, laboured under such Difficulties, that it almost seems impossible to produce any System of it under 20 or more Years to come. For this Reason the *Academy of Sciences* have lately taken a Resolution, for the Benefit of Lovers of History, to begin a Collection of all Sorts of short Treatises, and authentick Documents relating to the History of that Empire, and to publish it, from Time to Time, in separate Pieces, both in the *Russian* and the *German* Languages. Their Intention in general is the same with what is aimed at in other Countries, by publishing Collections of Pieces of History and

and Records, viz. on one Side to gather Materials for a future compleat History, and on the other, to animate such Persons as have already made Collections with this View, to contribute their Part towards the publick Advantage. But their particular View in this Work is to bring to Light, from Time to Time, all that has hitherto remained unknown to foreign Nations about the *Russian* History, or has not yet been sufficiently inquired into, nor cleared up in printed Histories. For this Reason we shall take the History of the *Russian* Empire in it's largest Extent, so as to comprehend not only the History both Civil and Ecclesiastical, Learned and Natural, but also the Antiquities, Medals, Chronology, Geography, &c. of that Empire, not only with respect to the *Russian* Nation, particularly and properly so called, but also with regard to all the other Kingdoms and Provinces subject to the *Russian* Sceptre, nay, even to the neighbouring Parts of South *Tartary*. The first Part, which will speedily be published, shall serve for a Specimen, how far these Endeavours will meet with the Approbation of skilful Readers. In case this is well received, we will go on with others every Month, or thereabouts, so as to make up at the End of the Year a sizable Volume in *Octavo*, the 12th Part of which shall conclude with a compleat Table for the whole Volume. These are therefore to desire such Persons as are provided with proper Materials for our Design, and are inclined to communicate them to the World, in their own Names, or without mention of them if they had rather, to send them either in the *Russian*, or any other Language, into the Secretary's Office of the *Academy of Sciences*, in order to which the following Specification will shew in what Manner the different Materials may be ranged and published.

St Petersburg,
Sept. 9, 1732.

1. Extracts and Translations of all the Historical Manuscripts and Chronicles of *Russia*, as are either already extant, or may hereafter be discovered.

Specification of
the Materials,
which are to
serve for the
intended Col-
lection.

As for Instance, out of the *Stepenniaia Kniga*, the *Chronicon*, or *Synopsis Kioviensis*, the Chronicle of the Abbot *Theodosius* of *Kiow*, the Chronicle of *Barlaam Palizin*, some anonymous Chronicles, &c.

2. Histories of the Lives of the most celebrated Sovereigns of *Russia*, of either Sex, carefully gathered from proper Accounts, printed, as well as Manuscripts.

For Instance, the Lives of *Ruric*, *Igor*, *Olga*, *Wladimir the Great*, *Wladimir Monomachus*, *Alexander of Neva*, and all the other Czars, Emperors, and Empreſſes, from *Iwan Baſilowitz* the First, to the present Time.

3. Genealogical Accounts and Tables, both ancient and modern, of the Family of the great Dukes, Czars, and Emperors of *Russia*.

For

For this I have prepared and drawn up 12 Tables, representing, most distinctly, the Succession of the several great Dukes, Czars, and Emperors, from the great Duke *Ruric*, down to the present Empress, with their several collateral Branches, as far as there is any Notice to be had of them; Princes who had only Allowances from the Crown; Princesses married, or unmarried; as also, the intruded Sovereigns, who filled the Throne during the Troubles of several Interregnums.

4. A Geographical, Chorographical, and Topographical Description of all the Countries, Territories, and Towns subject to the Sceptre of *Russia*.

For Instance, a compleat Geography of *Livonia*, *Esthonia*, *Ingria*, and *Carelia*, and afterwards also of other Governments and Territories, taking, at the same Time, Notice, in a few Words, of the History of each City or Town. Also, Descriptions of particular Cities, and what is remarkable in them, as *Moscow*, *St Petersburg*, &c.

5. An Explanation of all the *Russian* Coins and Medals both ancient and modern.

Under this Head succinct Accounts may be given of the diverse Transactions which occasioned the coining of them; particularly, the History of the Arms of *Russia*, deduced from their Coins and Medals.

6. A Description of all Kinds of *Russian* Antiquities, natural Curiosities, &c.

For the first, the Imperial Cabinet here will furnish a sufficient Store; as for Instance, Idols of Gold, Copper, and Iron, Ornaments for Dress, Vessels, and other Antiquities, which were from Time to Time found in *Siberia*. On the other Head, an Account of the Mineral Waters at *Olonitz*; the flying Squirrel, the Asbestos, the Mammot, and other natural Curiosities peculiar to *Russia* and *Siberia*, not to be met with in other Countries.

7. All that relates to the Ecclesiastical History, or can contribute to the illustrating of it.

For Instance, of the Idolatry of the ancient Inhabitants of *Russia*; of their Conversion to the Christian Religion; of the Endeavours used by the Church of *Rome* for uniting with the *Grecian*, and particularly that of *Russia*; of the Succession of the *Russian* Metropolitans and Patriarchs; of Archiepiscopal and Episcopal Sees, of Convents, &c.

8. Diverse

8. Diverse Transactions relating to the History of Learning in *Russia*.

Such are, a History of the Schools and Academies of *Russia*; of the Use of Characters, and the Introduction of the Art of Writing; of the Rise and Progress of Printing in *Russia*; a List of all the Books printed in *Russia* to this Time.

9. Diverse Particulars and Miscellaneous Subjects gathered out of various Parts of their History.

For Example; the Conquests of the Country of *Siberia*, and Kingdoms of *Casan* and *Astracan*; of the Manners and Customs of the different Nations of *Siberia*; of their several Languages; of the planting of *America* from *Siberia*; the History of the Commerce of *Russia*; of the Tribute anciently paid to *Russia* by the *Livonians*; the History and Description of the Globe of *Gottorp*; the History of the Navigation by the North-East Passage; particular Advices concerning the Country of *Kamtschatka*, &c.

10. Extracts of Books and Papers published here by the Academy of Sciences, as far as they chiefly relate and contribute to the ancient and modern History of *Russia*, Civil or Ecclesiastical, or of Literature and Nature.

Under this Article will be ranged, among others, some Treatises of Professor *Bayer*, relating to the ancient History and Geography of *Russia*; as likewise, Dr *Duvernoy's* Anatomical Accounts which relate to Natural History, with his Description of some Monsters produced in *Russia*.

11. Discoveries of Errors committed by foreign Authors in the History and Geography of *Russia*.

Under this Head the most modern Authors will be chiefly taken Notice of, as they are most likely to produce new Mistakes. Accordingly two Treatises lie ready on this Subject, the one containing Observations on M. *Strahlenberg's* Northern and Eastern Part of *Europe* and *Asia*, as also on his Map; the other on the *Origines Russicæ* of M. *Schottgen*, Rector of the School at *Dresden*.

12. Diverse Historical and Geographical Accounts of the neighbouring *Tartarian* Kingdoms and Countries, with which *Russia* has a constant Intercourse, but are otherwise little known.

Such are the *Cossacks*, the *Tartars* of *Crim*, *Dagestan*, *Nagaya*, *Cbiwa*, *Bucharia*, *Calmucks*, *Mongals*, and others; of the History of their Government; of the Description of their several Countries, as to their Situation, Manners, Customs, Commerce, Religion, Language, Learning, Arts and Sciences, &c.

The Collector and Publisher is to be *Gerhard Frederick Muller*, Member of the Imperial Academy of Sciences of Russia, and of the Royal Society of England; as also Professor in Ordinary of History: But in his Absence this Work is carried on by his Collegue in the Professorship of History, *Adolphus Bernardus Cramer*.

*An Extract of a Topographical * Account of Bridgnorth in the County of Salop, communicated to the Royal Society by the Rev. Mr Stackhouse, Minister of St Mary Magdalen in that Town; containing an Account of the Situation, Soil, Air, Births, and Burials of that Place, and of some Tumuli Sepulchrales near it.*
No. 464. p. 117. Read June 3, 1742.

II. *Bridgnorth* † is pleasantly situated upon the River *Severn*, on the West of the ancient Forest of *Morse*, and was built, according to *Camden*, by *Edelfleda* ‖, Lady of the *Mercians*; but encompassed with a Wall, and fortified by *Robert de Belesme* ‡, Earl of *Shrewsbury*; and afterwards favoured by King *John*, and other Kings, with many and great Privileges granted in their respective Charters. It is governed by two Bailiffs with the Burgessees in Common Hall assembled: The Bailiffs are annually chosen out of 24 Aldermen upon *St Matthew's Day*, after the following remarkable Manner: The Court being met, the Names of twelve Aldermen (Seniors of those that are there present, and who have not been Callers for three Years before) being separately written upon small Scrolls of Paper, all of the same Size, and rolled up close by the Town-Clerk, are thrown into a large Purse, which being shut, well shaken and tossed by the two Chamberlains, standing upon the Chequer **, is afterwards held open betwixt them before the Bailiffs; whence each Bailiff, according to Seniority, putting in his Hand, takes a Scroll, by which the Callers are fixed, who immediately mounting the Chequer, alternately call the Jury out of such Persons as are Burgessees, and then present in Court, to the Number of fourteen. These being

* Taken from the original Papers of the Rev. Mr *Richard Cornes*, late Minister of the Parish of *St Mary Magdalen* in *Bridgnorth*.

† A softer Pronunciation only of it's old Name *Brugg*, or *Brugg-north*. In a Charter of King *John*, it is called *Bruges*; in another of *Edward III*. *Brugg* and *Brugg-north*; and in a third of King *Charles I*. *Bridgnorth*, alias *Brugg-north*, alias *Bruges*. Both *Brugg* and *Bruges* signify a Bridge, or Bridges, and the Termination *North*, whether it be, as some would have it, a Corruption of the Word *Morse* or not, was, doubtless, added with regard to the Situation of the Place. N. B. *Bruges* in *Flanders* is so called from it's many Bridges, and *Brugg-bote* is an old Word for Pontage, or Bridge-toll.

‖ *Edelfleda*, alias *Elfleda*, eldest Daughter of *Alfred the Great*, said by some to be the first absolute Monarch over the *English*. She married *Ethelred*, to whom *Alfred* gave the Government of the City of *London*, which he had then taken from the *Danes*, and the Title of Earl of *Mercia*, an empty Title, till by his Valour he became Master of a great Part of that Province. After his Death, *Elfleda*, being a Princess of great martial Prowess, took upon her the Government of her Husband, and fortified many Towns, to keep the *Danes* out of *Mercia*: Afterwards she carried her Arms, in Conjunction with her Brother King *Edward*, against the *Welsh*, and obliged them to become tributary. About this Time (913) she is said to have built and repaired several Places, as *Stafford*, *Bridgnorth*, &c. See *Rapin* from *Sax. Ann. Hunting. Howend*. Vol. I. pag. 38.

‡ *Robert de Belesme*, a Man outrageously cruel to his own Sons and Hostages, whom he castrated with his own Hands, and plucked out their Eyes: but being deserted by the *Welsh*, was seized, and, being convicted of High-Treason, was afterwards imprisoned, others say, banished for Life; and thus suffered condign Punishment for his notorious Wickedness. See *Camden*, *Baker's Chronicle*, &c.

** A large square Table in the Middle of the Court, encompassed with Seats.

all sworn neither to eat or drink, till they, or 12 of them, have made Choice of two fit Persons (who have not been Bailiffs for 3 Years before) to serve the Office of Bailiffs for the Year ensuing, are locked up together, until agreed; which hath often occasioned very long and tedious Fastings, even to the Prejudice of their Healths: However, when they are agreed, they make Report of the Persons they have elected, and they are sworn into Office upon *Michaelmas-day**.

This Borough, as others, has a Recorder, Town-Clerk, and two Representatives in Parliament.

The Town is divided by a stately Stone Bridge † over the *Severn* into 2 unequal Parts; the lesser Part, that lies upon the East of the River, is called the low Town, and consists of 2 Streets, one extending from the Bridge to the very Foot of *Morse*, and goes by the Name of *St John's-street*, from a religious House there in Times of Popery, dedicated to *St John* the Baptist.

The River abounds with divers Sorts of the most excellent Fish, as *Salmon*, *Pike*, *Shad*, *Trout*, *Greyling*, *Flounders*, *Eels*, *Chub*, *Gudgeon*, and what goes here by the Name of *Samlet*, a small Fish spotted with Red, not much unlike the *Trout*, only the Spots lie in a more direct Line on it's Sides. It seldom exceeds 4 or 5 Inches in Length, and is of a most delicious Taste, but to be taken only at certain Seasons of the Year: In Summer, when the Water is low, the Fisher goes bare legged into the Shallows, and, having on a Pair of old Shoes, stirs up the Gravel and Sand, so as to discolour the Water; and thus, by angling there, usually takes many of them, together with *Gudgeons* and *Blays*; but they are mostly taken with an artificial Fly.

The Head of this River is on the Mountain *Plymlymon*, in the County of *Montgomery*, whence it flows through this County, that of *Worcester*, and *Gloucester*, diffusing it's vital Moisture as it passes, till it empties itself into the *Severn* Sea below the City of *Bristol*. It is navigable for about 140 Miles, and has a great Number of Vessels ‖ continually plying upon it.

The Soil in these Parts is of a very different Nature: Eastward of the River *Severn* lies a fine, dry, sandy Soil, fit for bearing *Rye*, *Barley*, &c. and is therefore commonly distinguished by the Name of the *Rye-land* from the other Parts of the Country, that lie on the West of the River; where the Soil is much upon a moist Clay, fit for *Wheat*, *Pease*, &c. yet not so peculiarly adapted to these Sorts of Grain, but

* The Bailiffs for the Time being are Justices of the Peace, and Lords of the Manor for the said Town and Liberties, which are extensive, being one Way 6 or 7 Miles.

† This Bridge has 7 Arches, and formerly had a Draw, Portcullis, and other Engines of Defence: The old Gate-house upon it is still standing, and several other Houses have been built upon it's Piers.

‖ Most of the Vessels made use of upon this River are built here in several Dock-yards.

that several lighter Parts of this Quarter oftentimes bear very plentiful Crops of *Barley, Oats, &c.*

The common Fields adjoining to the Town bear Grain of all Kinds, one of them being yearly appropriated for Corn; nay, the very Sides of the Rock upon which the Town stands, though the Soil there be but shallow, yet, when well manured, produces great and very early Crops of *Pease, Beans, Cucumbers, Asparagus*, and all Sorts of Garden-herbs in Perfection.

The high Town lies upon the Western Bank of the River: That rises gradually to a considerable Height. The Ascent begins from the End of the Bridge, where what is first worth Notice, is a Passage* for People on Foot, cut deep in the Rock, ascending with convenient Flights of Steps at proper Distances, much resembling, as Travellers have observed, the Ascent of Mount *Calvary* in *Jerusalem*. On the South of this Passage opens a large Cave† in the Rock, remarkable here for being the Repository of excellent Beer: At the Entrance of this stands a Lion rampant, carved in Stone, and within is a large Tun containing above 5 Hogsheads.

The Air of this Place is exceeding healthy, and, for ought I know, may vie even with that of *Montpelier* itself. It is certain we have very few consumptive People amongst us, so that as it is preservative to the Natives, in all Probability it might be restorative to Strangers. However, we have this Convenience from the Variety of Situation‡, that if the Air in the upper Part of the Town be too fine and sharp for our Constitutions, we may soon remove into the lower, where it is much softer, and by that Means possibly find Relief, and continue till old Age in it's natural Course carries us to the Grave. In short, many of the Inhabitants here live to very advanced Years, there being many Instances of those that have exceeded an hundred †.

* About 160 Yards in Length.

† In Length 33, in Breadth 27 Feet.

‡ Dr *Hollins*, an eminent Physician in *Shrewsbury*, Father to the late Dr *Hollins*, Physician to his present MAJESTY, made it his Observation, that when any epidemical Distempers were abroad, *Bridgnorth* was sooner freed from them than any other Place that he knew. The same hath been since confirmed by the Observations of Dr *Anthony Weaver*, now an ingenious Physician in this Place.

† N. B. There are three old Hatters now living (1739) in the Parish of *St Mary Magdalen*, and bidding fair for an hundred each, whose present Ages, being computed together, make somewhat more than 257 Years.

A Table of Births and Burials for 12 Years, in the Parish of St Mary Magdalen, which contains about 520 Families; and of St Leonard, containing about 550 Families; which, allowing five to each Family, amounts to 2600 Inhabitants in the Parish of St Mary, and to 2750 in the Parish of St Leonard; in all 5350.

In the Parish of
St Mary Magdalen.

Births. Burials.

54.	119.	Small-Pox.	1727.
72.	77.	- - -	1728.
52.	74.	- - -	1729.
65.	78.	- - -	1730.
75.	36.	- - -	1731.
64.	41.	- - -	1732.
70.	46.	- - -	1733.
69.	77.	- - -	1734.
46.	56.	- - -	1735.
60.	32.	- - -	1736.
67.	22.	- - -	1737.
61.	53.	- - -	1738.
755.	711.		

In the Parish of
St Leonard.

Births. Burials.

68.	100.	Small-Pox.
72.	61.	
54.	78.	
84.	65.	
70.	53.	
47.	49.	
79.	65.	
64.	90.	
72.	57.	
79.	39.	
71.	56.	
62.	65.	
822.	778.	

Total Increase 88.

In July 1740, I observed upon Morfe the Tumuli, represented in Fig. 1. where the Soil is a strong Gravel. Montfaucon in his Antiquities tells us, that the old Cimbri* were wont to throw up Heaps of Gravel upon their Graves; and that the more remarkable the Persons were, the larger were the Tumuli over them. I therefore imagined, that this might possibly be a Burying-place of the Danes, who, I think, 'tis generally owned, were Descendants of those People. For Satisfaction, I caused the middle and largest Tumulus to be dug through from North to South (aa) supposing by that Method I must cross the Site of any Body that might have been laid there. We dug about 7 Feet deep, even to the solid Rock, without meeting with any Thing remarkable, but an Iron Shell, in Shape of a small Egg, with a round Hole at one End, but so cankered and decayed, that it easily broke into small Pieces; this we judged to have been the Bos of a Sword. However, upon viewing the Trench that we had dug, we perceived upon the West Side a Hollow in the Gravel, which, upon Trial, extended horizontally 4 or 5 Feet; and under this Hollow (bb) we found one of the large Vertebrae of the Loins, with it's Processes pretty perfect, but thoroughly petrified; and, upon further Search, several Portions of Bones, all alike

* Old Inhabitants of Denmark.

petrified,

petrified, but so disguised, that we could not discover to what Part of the Body they belonged. We afterwards opened one of the lesser Tumuli (c.c.) and found what is thought to be the Os Sacrum, and many other small Pieces of Bones, in a petrified State. It was great Odds that we had found nothing at all; but Nature favoured us, by preserving some few Tokens of Antiquity. During this Search, the People were much alarmed, and flocked to the Place in great Numbers, expecting, I presume, to have seen Wonders; but being disappointed, they soon spread a Report over the Country, that by a Discovery made by some ancient Writings, we dug there for Treasure, by which we were greatly enriched: To prevent the further Concourse of the People, &c. we were glad to fill up the Trenches, and leave the other Tumuli unexamined.

N. B. The middle Tumulus is about 9 Yards in Diameter, and the lesser about 8 Yards each at the Plain.

An Account of
a Book present-
ed to the Royal
Society, and
intituled, No-
titia Hungariae
novae Histo-
rico-Geogra-
phica, &c.
Auctore
Matth. Belio.
By the Rev.
Zachary
Pearce, D.D.
F. R. S. &c.
No. 450. p.
398. Oct. &c.
1738.

III. The Author of this Work is the Rev. *Matthias Bell*, a Pastor among the *Lutherans* at *Presburg* in *Hungary*. About 12 Years ago he published an Account of what he intended to execute; and by the Encouragement of his present Imperial Majesty, and some of the Nobility, he went on with it, notwithstanding many Difficulties, which (as he tells us) he met with in the Undertaking, and published the first Volume last Year.

This first Volume is to be followed by several others; for the Kingdom of *Hungary* includes 48 Districts or Counties, and this Volume gives an Account of only one of them, and indeed is chiefly taken up with the History of the City of *Presburg* (or *Pisonium*, as he calls it); which, though inferior in other Respects to the City of *Buda*, is the Place where the Emperors (as Kings of *Hungary*) are crowned, where the States of the Kingdom assemble, and the Courts of Justice are held.

This Volume consists of two Parts: The first is general, and gives an Account of the physical and political State of the whole District or County of *Pisonium*, describing it's Soil, Produce, Rivers, the Temperature of it's Air, the Nature of it's Inhabitants; it's ancient Inhabitants and present ones, it's Nobility, Magistrates, and whatsoever belongs to the Natural and Political History of the District.

The second Part (which is much the largest) is taken up with the Description of the City of *Presburg*; where the Author is very copious and elaborate in setting forth every Thing that relates to it: Particularly it's ancient State under the several Nations who possessed it, and it's present State under the *Austrian* Family; all it's Privileges and Prerogatives, especially of the Inauguration of their Kings, which he describes in all it's Parts, even to a most minute Exactness. He then enters into a Detail of the present State of the City, it's Churches, and other publick Buildings, it's Magistrates, Islands adjoining, and the Country round about it's Walls; leaving to the next Volume the Description of the

four other Cities, or principal Towns, which are situated in the same District.

The Work is printed after a most beautiful and expensive Manner, with all the Ornaments of Engravings that may set it off to the best Advantage. There are two different Prospects of the City of *Presburg*, and a Map of the whole District, which seems to be very accurately taken, and is made by *Samuel Mikovinius*, a noble *Hungarian*, and Member of the *Royal Society of Berlin*. Every other District is to have a Map of it placed before the Description of it: And the Maps are made in an Astronomico-Geometrical Method, upon a careful Survey of each District; for which laborious Work the States of the Kingdom of *Hungary*, by Order of the Emperor, were pleased to give him all Manner of Encouragement and Assistance: As they have likewise to Mr. *Matthias Bell*, the Author of the Description, to which the Maps are prefixed.

Upon the whole, should this Author live long enough (if any Life be long enough) for the finishing of so very extensive a Design, the Libraries of the Learned will receive a great Addition, which may not only gratify their Curiosity, but afford Matter of Improvement in the History of *Hungary*.

IV. M. *Fourmont* is well known to the learned World for some curious Pieces which he has already published, and for very many others in almost all Languages, which he has prepared for the Press, and the Titles of which he has given us in a Catalogue of his Works printed at *Amsterdam* 1731, in 8vo.

This Work of his is intituled, *Reflexions Critiques sur les Histoires des Anciens Peuples, &c.* lately printed at *Paris*, in 2 Vols. in 4to, at the Expence of some *French* Gentlemen of his Acquaintance, as he tells us in the *Advertisement* placed before his *Preface*.

His general Design is to set right the History of the most ancient Nations, particularly the *Chaldeans*, *Hebrews*, *Phœnicians*, *Egyptians*, *Greeks*, &c. down to the Time of *Cyrus*, the Founder of the *Persian* Empire.

The Work consists of three Books.

In the first of which he gives us at Length the famous Fragment of *Sanchoiathon* the *Phœnician*, as translated by *Philo Byblius*, and preserved by *Eusebius* in his *Præparatio Evangelica*, Lib. I. cap. 9.

With this Fragment he has published a *French* Version of it, in which he endeavours to distinguish between the Account given by *Sanchoiathon* the Author, and what he supposes to be the Additions of *Philo* the *Greek* Translator.

After this he examines into the Reasons brought by several of the Learned for and against the Genuineness of the Fragment, and determines in Favour of it with as much Weight of Argument as the Question will admit. He then takes Notice of a Treatise, written on the same Subject as his own, by our learned Countryman Bishop *Cumbe-*
land;

*An Account by
the Rev. Za-
chary Pearce,
D. D. F. R. S.
of a Book in-
tituled, Re-
flexions Cri-
tiques sur les
Histoires des
Anciens Peu-
ples, &c. No.
456. p. 313.
Jan. &c. 1740.*

land; and having examined and declared his Dislike of the Bishop's Scheme in the main, he prepares his Reader to expect full Satisfaction from his own, which makes the Subject of his second Book.

In his second Book, he undertakes to reconcile the Generations of Men set forth in *Sanctoniathon's* Fragment, with those which are recorded by *Moses* of the Patriarchs before and for some Time after the Flood.

By the Help of *Hebrew*, *Phœnician*, and *Egyptian* Etymologies, he often makes the Names, which at first Sight are almost all quite unlike, to be the same in Sound, or at least in Sense. And by this Application of his Skill in the ancient Languages, he readily finds out a Coincidence between *Moses's* and *Sanctoniathon's* earliest Generations.

But his main Work, and what he appears most pleased with, is his Discovery of *Abraham* and his Family among the later Generations recorded by *Sanctoniathon*. Having laid down (upon good Grounds, as he assures us) that *Ouranos* is *Terah*, the Father of *Abraham*, he undertakes to prove, that *Abraham* is the *Cronus* of *Sanctoniathon* and the *Saturnus* of the *Latins*; that *Sarah* (his Wife) is the same with the Goddess *Rhea*; that *Ishmael* (*Abraham's* Son) is the *Muth* of *Sanctoniathon*, and the *Dis* or *Pluto* of the *Greeks* and *Romans*: That *Isaac* (*Abraham's* other Son) is the same with the *Sadid* of *Sanctoniathon*, with *Jupiter* among the *Latins*, and *Zeus* among the *Greeks*, his Wife *Rebecca* being *Juno*; that *Esau* (*Isaac's* eldest Son) is *Osiris* and *Bacchus*, and that *Jacob* (the youngest) is *Typhon*. And, in like Manner, he finds a very great Part of the *Grecian* Theology in *Abraham's* Family.

In the mean while his Readers will, perhaps, make two very material Observations on this extraordinary Discovery of his: The one, that *Cronus's* Character in *Sanctoniathon's* Fragment, is the most immoral and tyrannous of any recorded there: And how to reconcile this with the Character given in Scripture to *Abraham*, as *the Friend of God*, the *Father of the Faithful*, &c. is no easy Task: It requires (to be sure) more than a Resemblance of two or three Circumstances, common to *Cronus* and *Abraham*, when their Historians in 50 other Circumstances make their Characters essentially different. The other Consideration which occurs, when we read this Treatise, is, that *Abraham* had ill Luck indeed, if, when he left his native Country because of the Rise of Idolatry there, all the grosser Idolatry of the Heathen Nations after his Time took it's Rise from him and his Family: The very Crime which he took Pains to avoid, he was the accidental Occasion of, if he and his are to be thus placed at the Head of the Heathen Theology.

The Author having finished this remarkable Part of his Work, enters into a very learned Detail of the particular Gods of the several Heathen Nations, who are most celebrated in History; and he has shewn a great Compass of Reading upon this Occasion. Hardly any Writer has been more copious on the Subject, or has given better Hints for clearing up many Passages of sacred and profane Story.

In his third Book he has treated at large about the Dynasties of Egypt, and the Shepherd Kings who reigned there: Both of them, perhaps, the darkest Spots in the whole Face of Antiquity. He has taken great Pains to fix the Epochs of the Kings of Sicyon, Sidon, and Tyre, of Arabia, Assyria, Lydia, of the Medes and Babylonians; concerning all which he has laid together the most remarkable Testimonies of the Ancients. At length he comes to his favourite Point, the Chinese History, and gives us (as he says) a complete List of their Kings, from the Flood down to the present Monarch of that Empire, and shews that the Chronology of the Chinese may be made pretty nearly consistent with the true Chronology of the Old Testament.

And for this Part of the Work the Author seems well fitted, being skilled (as he tells us in his Preface) in the learned Characters of that Country, which he has studied for near 20 Years, and has for some Time taught in the Royal College at Paris; and having composed 5 Dictionaries, and a Grammar of that Language, together with a Translation, almost entire, of the Geography of Tamim, which contains no less than the whole History of that Empire: On which Occasion he applies to himself, and the Progress which he has made in the Chinese Learning, those expressive Verses of Virgil in his sixth Book of the *Aeneid*:

——— *Pauci, quos æquus amavit*

Jupiter, aut ardens evexit ad æthera virtus,

Diis geniti, potuere.

V. The Title Page is as follows: A Description of Old and New Greenland, or a Natural History of Old Greenland's Situation, Air, Habitude, and Circumstances,

The Beginning and End of the Old and New Norwegian Colonies. The present Inhabitants, their Original, Manners, Living, and Employments.

The Products, as Beasts, Birds, Fish, &c. With a new Chart, and several Copper Plates. By Hans Egedius, formerly Missionary in Greenland, and now Superintendant and Professor in that Language.

It is dedicated to the Prince Royal of Denmark, &c. Imprimatur Marc Woldike.

CAP. I. Situation, Climate, and Soil, to p. 4.

Greenland lies about 160 English Miles West from Iceland, begins at 59° 40' N. Latitude.

It's East Side stretches to Spitzbergen 78 to 80° Lat. and believed to be an Island separate from Greenland.

It's West Side is known to 70° Lat. If Greenland is an Island, or joined to other Countries, it is not known for a Certainty, but probably joins to America on the N W Side: For between America and Greenland,

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G g g

stretches

An Abstract of a Natural History of Greenland, by Hans Egedius, intitled, Det gamle Gronlands Berlusstraffion, eller Naturels Historie, af Hans Egede. Kiobenhavn, 1741, 4to. Communicated by John Green, M. D. Secretary of the Gentlemen's Society at Spalding. No. 471. p. 607. Read Dec. 8, 1743.

stretches the *Fretum*, or Bay, called in the Sea-Charts *Davis's Straights*, which is navigated by them and other Nations on Account of the Whale-fishery, but to the Bottom of this Sound no Ship has ever been.

Greenland is a high rocky Country, which is always covered with Ice and Snow, which never thaws except near the Sea. The highest Land can be seen 80 *English* Miles from the Sea. The whole Coast is fortified with large and small Islands. It has several Firths or Rivers, which run a long Way within Land; amongst which is *Baal's River*, where the first *Danish* Colony was fixed in 1721, which runs 80 Miles within Land. That in all Sea-Charts called *Forbisher's Strait*, also *Baer-Sound*, which are said to make 2 large Islands at a Distance from the main Land; but, in Reality, I did not find them so.

CAP. II. *Colonies and Conversion*, to p. 23.

Greenland was first discovered by the *Norwegians* and *Icelanders*; and the brave *Raude*, who first discovered it in 982, praised it, and persuaded several of his Countrymen to inhabit it; and at the Instance of *Oluf Tryggesson*, first Christian King in *Norway*, carried a Priest with him, who taught and baptized all the Inhabitants; and from Time to Time *Greenland* multiplied into new Colonies, many Churches and Abbeys were built, Bishops and other Teachers provided for: But the *Norwegians* were not the first Inhabitants; for they found wild People on the West Side, who without Doubt were originally *Americans*. The present Inhabitants probably are a Race of the *Schrellingers*. In 1545, *Ditbmar Blefken* reports a Monk, with his Bishop, sailed to *Norway*, lived to 45 Years in *Iceland*: And he reports, that a *Dominican* Cloister was in *Greenland*, called *St Thomas*. But this is proved false by *Arngrim*.

Mogens Heinsson was sent to find out *Greenland*, and was obliged to return, because his Ship was stopped (as he imagined) by magnetical Rocks under Water, although the Wind was favourable; but the real Magnets probably was the Current, which is so strong at *Staton Point*, a Ship under full Sail with the fairest Wind sails slow.

In 1721, a Company of Traders was set up in *Bergen*, with a Royal Privilege, when King *Frederic* resolved to begin a Colony at 64°, wherewith I and my Family went, and continued 15 Years. Our Design was to find the Eastern District, as the best: A *Hollander* affirmed some of their Ships had been there, and found the Land free from Ice in 62°. This I found to be true in 1736, on passing *Staton*, *Huck*, and *Cape Farewel*, near the Land, then free from Ice on the Coast, which was not usual: But as it is seldom that Ships can come with Safety to the East Side, it is most convenient with small Boats through the Openings near the Main, where the Current setting S W prevents the Ice from fixing.

CAP. III. *Natural Products*, to p. 27.

In the Bay of *Hope* there are many good Places for feeding of Cattle, with proper Ground for Tillage, and good Water: No Trees, except within the Rivers, only Brush-wood: Juniper-bushes abound here, whose Berries are the Size of the largest Pease. There are divers Plants here, as *Angelica*, *Rosemary*, *Scurvy-grass*; and a Grass with yellow Flowers, whose Root smells like Roses in the Spring.

In 60 and 65°, the Country is best, and *Barley* will ripen there: *Turneps* and *Colworts* grow well; especially the first, which are large, and of a sweet Taste.

There are Rocks which produce *Verdegriſe*, as also *Sulphur* or *Brimstone*, *Marcaſſite*; and I found on an Island one of a yellow brown Sand, having *Cinnabarine* red Veins. There are whole Mountains of the *Aſbeſtos*. There is found a grey Stone, or Baſtard Marble, of different Colours. The Sea produces ſeveral Sorts of *Conchs* and *Muſſels*, alſo divers Sorts of *Corallines*.

CAP. IV. *Air and Weather*, to p. 32.

The Summer here laſts from *May* to *Sept.* The Cold at 64° is moderate, but at 68, &c. extreme, and will freeze Brandy.

The Land is conſtantly covered with Ice and Snow, except near the Sea, and in the Rivers. Although the Summer oft-times is warm in *Greenland*, it ſeldom or never thunders, &c. The *Aurora Borealis* is ſo ſtrong here towards new Moon in clear Weather, as you may read by it.

CAP. V. *Beaſts and Birds, Hunting and Fowling*, to p. 36.

Greenland produces *Bears*, which live on the Ice, and are dextrous at catching *Otters*, *Seals*, &c. *Rein Deer* are in great Plenty. *Hares* are very large, good, and white all the Year. There are Plenty of *Foxes*. They have *Dogs*, none of which can bark, only howl.

Their Birds are the *Ryper*, or *Wood-Partridge*, *Ravens*, *Eagles*, *Falcons*, *Sparrows*, *Goldfinches*, &c.

The *Mosquitoes* are very troubleſome in *July* and *Auguſt*.

CAP. VI. *Fishes and Amphibious Animals, and Fiſhing; Whales, Narval, or Sea-Unicorn, and Sea-Birds*, to p. 55.

The Sea produces *Whales*, the *Fin-fiſh*, which live on a Kind of *Louſe*, brown-coloured, who moves ſo ſlow, that he may be taken by Hand. This Creature is oily, and, when rubbed with the Fingers, produces *Train*.

There is another Sort of *Whale* in theſe Seas, called *North-Capers*, which feed on *Herrings*; as alſo the *Sword-fiſh*, who is the *Whale's* greateſt Enemy; and when he kills one, eats nothing but his Tongue, leaving the reſt to the *Shark*, *Walroſs*, and Birds of Prey. In theſe Seas

Abstract of a Natural History of Greenland.

are *Cachelots*, or *Pot-fish*, a Sort of *Whales*, their Length 50 to 70 Feet. The *White-fish* are likewise in these Seas, like a *Whale*, but without Fins on the Back. There is likewise a small *Whale* produced here, called *Butts-kops*; as also *Unicorns* of the *Whale* Kind, which they call *Narval*: Their Horn, as some Authors affirm, are not Teeth, because it's Root is not in the Jaws, but goes a long Way into the Head. The *Niser*, or *Porpoise*, are also in these Seas; as also the *Walrofs*, shaped like a *Seal*, but much larger; his Flesh is like fat Pork: His irreconcilable Enemy is the white *Bear*. There are several Sizes of *Seals*, but of the same Shape, except the *Klap-myss*, which has a cartilaginous Hood, which covers his Eyes. There are other Fish, as *Sharks*, *Holly-butts*, *Red-fish*, *Trout*, *Salmon*, *Bull-heads*, *Stone-biters*, *Smelts*, *Whittings*, *Herrings*, and a Fish like a *Bream*, with Pricks on it's whole Body. There are *Mussels*, and some large ones that produce the Pearl. Here also are *Shrimps*, *Crabs*, &c.

Amongst the Sea-birds are the *Edder*, *Ducks* of three Kinds; as likewise the *Alker*, and the *Tornauviarsuk*, which has beautiful Feathers, and the Size of a *Lark*: There also are *Geese* here. *Greenland* produces *Maws*, *Redshanks*, *Cormorants*, *Lunders*, *Parrots*, *Sharvers*, *Tersters*, *Angle-tasters*, *Snipes*, &c.

CAP. VII. *Impliments and Utenfils*, to p. 63.

The Impliments of the *Greenlanders* on Shore, are to shoot *Reindeer*; and at Sea to catch *Whales*, *Seals*, *Birds*, &c. The Bow is about 6 Feet long, of tough *Fir*, which they bind round with *Deer* Sinews: The Point of the Arrow is pointed with Iron or Bone. All the Sort of Fish they catch, and cannot eat fresh, they dry against Winter.

The Boats are of two Sorts; one used only by the Men, about three Fathom in Length, their Breadth about 19 Inches, with an Hole in the Middle, not larger than one Man, close-laced, can thrust himself into; with these Boats they are able to row 72 Miles a Day, using only one Oar.

CAP. VIII. *Manners and Habitations*, to p. 66.

Their Houses are of two Sorts, Winter and Summer: The former are made of Turf and Stone, from 4 to 6 Feet high, flat-roofed; on one Side are the Windows, made of bleached *Seal-guts*, *Holly-butt Maws*, sown together, and are sufficiently transparent: Their Doors are very low, they creep in on their Hands and Knees. Their Summer-houses are made by raising Poles, which they cover with young *Seal-skins*.

CAP. IX. *Shape, Constitutions, and Tempers*, to p. 68.

The Inhabitants of the Northern Parts are troubled with *Dysenteries*, *Bloody-fluxes*, &c. They have seldom any contagious Distempers: They use no Medicines; and, instead of Remedies, their Conjurers

jurers mumble over their Bodies some strange Jargon. Wounds they sew up; Cataracts on the Eyes they take off as follows: They insert a crooked Needle under the Skin, and with a Knife raise it up, and draw it off safely. When their Children are troubled with Worms, the Mother puts her Tongue up the Fundament to kill them.

CAP. X. XI. and XII. *Of their Customs, Capacities, Cloathing, Diet, and Cookery, to p. 77.*

CAP. XIII. *Marriages and Education, to p. 82.*

They have riotous Assemblies, in which it is reckoned good Breeding, when a Man lends his Wife to a Friend. None come to these but married People. The Women esteem it a Piece of Fortune when they have to do with their Prophet, and the Husbands pay them for the Honour; especially if they prove with Child, their own Endeavours having been fruitless.

The Women, as soon as delivered, go immediately about their usual Work. The Navel-string must not be cut by a Knife, but a *Mussel-shell*, or bit off; when dried, it is used as a Charm. They hold a Piss-pot over the Womens Heads whilst in Labour, thinking it to promote hasty Delivery: They seldom bring Twins, but often Monsters.

CAP. XIV. *Manner of burying their Dead, and preserving their Corpses under Tumuli of Stones.*

CAP. XV. *Games, Poetry, Music, and Dancing, to p. 93.*

They have several Diversions amongst them, as Singing, Dancing, in which they challenge one another. They play likewise at Foot-ball: Thus, they say, the deceased Souls play in Heaven with a *Walross's* Head, which is performed when the *Aurora Borealis* appears.

CAP. XVI. and XVII. *Language and Vocabulary, to p. 105.*

At Page 86, the Author presents his Reader with a *Greenland Ode*, much like *Lapland Poetry*.

Their Language has no Affinity with any known *European* one: Few Words are like the *Old Norwegian*. It is difficult of Pronunciation, as most of their Words are Gutturals. It has not the Letters c, d, f, g, x.

CAP. XVIII. and XIX. *Present State of Trade in Greenland, and of Religion there, to p. 120.*

Their Religion consists in nothing more than superstitious Ceremonies.

CAP. XX. Astronomy, to p. 125.

The Sun, Moon, Planets, and other Stars, they imagine had their Beginning from their Forefathers, and were formerly People by a singular Manner taken up to Heaven. They are of Opinion, that when the Moon does not appear, or is dark, it is seeking her Sustenance on the Earth: And they say farther, that it sometimes comes down, and makes Whores of their Women; for which Reason none dare lie on their Backs, before they spit on their Fingers, and stroke it over their Bellies; and young Girls dare not stare at the Moon, for fear of conceiving by her.

CAP. XXI. Considerations of the Author, for promoting the Success of his Mission, and the Salvation of the Greenlanders, to the End.

Antiquities of Prussia, by J. Theod. Klein, Sec. to the Republic of Dantzick, and F. R. S. No. 457. P. 384. July, &c. 1740.

VI. Among the various Monuments of the Utensils, Luxury, or Ornaments of the ancient *Prussians*, which had been buried with them, there are sometimes digged out of the Earth triple Lines of ductile Copper, artfully turned and twisted, representing either a loosened Girdle, consisting of one, two, or three Circles, or else a truncated Cone, rising in a Spire from it's Base, with it's Spires so curiously elastic, that it may be easily pressed down, and will be above four Minutes in resuming it's former Shape. *Helwingius* calls the former *Funiculi metallici*, and judges rightly that they were used for Girdles: The latter he calls *Coronae Sepulchrales*. They are often found in Sepulchres, but very seldom entire.

Fig. 2.

One of these, perfect and free from Rust, measuring $6\frac{2}{3}$ Rhinland Inches at the Base, was sent to me in 1726, by a very reverend Gentleman, who at the same Time wrote to me his Opinion, that these spiral Cones were formed in Imitation of the brazen Serpent of the *Israelites*; with whom the ancient *Prussians* agreed in many Things with regard to their idolatrous Rites; and that these Images were laid in their Sepulchres by way of Charm; that the Serpents, which the ancient *Prussians* worshipped for Gods, being treated with such Reverence after Death, might not hurt their Bodies.

Without Doubt this learned Gentleman favoured the Opinion of those who derive the Origin of the ancient *Prussians* from the *Israelites*, whom *Salmanassar* carried into Captivity, which Opinion however has been weakened by *Christoph. Hartknock* *.

But though it is true, that the Pagan *Prussians* worshipped not only the greater *Dioestres*, *Perkunas*, *Pikollus*, and *Potrimpus*, and the Sun, Moon, Stars, Groves, Fountains, Elks, Toads, and other Animals, but also Serpents, offering Milk to them, chiefly in hollow Oaks, of a

* Dissert. iii. p. 48. §. v.

vaſt Bigneſs * ; and though I have ſeen myſelf in *Lithuania* ſome Serpents ſo familiar with Children, as to overturn their Porringers of Milk ; and when the Parents have come, upon the crying of the Children, they have done nothing to theſe troubleſome Guests but drive them away, as they would their Poultry, from their Children's Victuals : Yet it can no Way be thence inferred, that the ancient *Pruſſians*, in their Copper Spire, had any Regard to the brazen Serpent of *Mofes*, unleſs we would perſuade ourſelves, that they alſo worſhipped Toads and Frogs, and ſeveral Sorts of Inſects, and provided Images of them, with regard to the Plagues of *Egypt*.

Nor is it probable, from their Veneration to Serpents, which perhaps they kept without Numbers in Jars, and rendered very familiar to them, that they made Idols of them, much leſs Charms in their Shape, to keep their buried Bodies from Serpents, when it is paſt all Doubt, that the ancient *Pruſſians* did not bury their Dead till after they were burnt, which Cuſtom could not be quite aboliſhed even in the Time of Duke *Albert*, and therefore their Carcaſes could have no Need of Charms againſt the Injuries of Serpents. Beſides, it is well known, that the ancient *Pruſſians* were very rude for many Ages †, not knowing the Uſe of Wool or Iron, much leſs of Veſſels ſerving for Luxury ; but uſing horrible Clubs inſtead of Spears and Swords, and inſtead of Iron Hammers and Wedges, provided themſelves with Stones, which have been a long Time ſhewn for *ceraunia*, though not without ſome Degree of Industry. Therefore this Piece of Antiquity ſeems to belong rather to the middle Age of the *Pruſſians*.

But how *Helwingius* came to call this ancient Monument a *Corona Sepulchralis*, I cannot imagine ; for it has not the leaſt Reſemblance of a Crown, unleſs any one will fancy, that the Philoſophy of the *Pruſſians*, on Occaſion of a Funeral, which is ſometimes a very mournful Affair, as Death is the moſt terrible Thing to natural Men, invented ſuch a trembling Spire in the Room of a Crown. But there is not the leaſt Hint in any Author, that the ancient *Pruſſians* carried their Dead to their Funerals, with ſuch Ceremonies as are now in Uſe among us, ſo as to adorn the Coffins of Maids or Bachelors with Crowns : For there is no Mention any where of a ſepulchral Crown being laid in Honour of the Deceaſed, at the Side, or at the Head, or even at the Feet, as the Manner now is, for thoſe who have died in Celibacy.

It will be ſufficient to quote a Summary of the Funeral Rites from our *Hartknock* ‡ : “ When the Deceaſed was to be interred, he was firſt
“ laid on a Funeral Pile and burnt, and then his beſt Garments were
“ thrown into the Fire, and his Hounds, Horſes, Arms, and other

* In what Manner and with what Ceremonies the Banquets were prepared for Serpents, ſee *Hartkn.* in *Ant. & Nova Pruſſia*, p. 63. *Conf. Differt. ejus* viii.

† See *Henneberger* in *lib. de vet. Pruſſ.* fol. 5.

‡ *Differt. xiii. de Funeribus vet. Pruſſ.* p. 193. &c.

“ Things, in which he most delighted when alive. — They cast in
 “ also his Copper Rings and Bracelets, especially if he was a Christian.”
 And a little after from *Erasmus Stella*: “ They buried their Dead in
 “ their Arms and Cloaths, with a great Part of their Furniture.”
 Lastly from *Jacobus Leodinenfis*: “ The *Prussians* promised, that they
 “ and their Posterity should not for the future burn or bury their Dead
 “ with Horses or Slaves, or with Arms or Garments, or with other
 “ Things of Value, or observe any other Rites of the *Gentiles*, but
 “ bury their Dead in Cemeteries, according to the Custom of the
 “ Christians.”

These Things being duly weighed, we may venture to affirm, that the Monument in Question belonged to the ancient *Prussians*, and to some of high Rank among them, and that it is nothing but a BRACELET, which the deceased Person wore either as a Mark of some singular Service done to his Country, or of his Nobility; or else was used as a grand Ornament, and was buried with him among other Things, and lay in the Ground till it was now accidentally brought to Light.

This Opinion is confirmed by the learned *Bartholin*, who * gives a Figure of a Bracelet, composed of several Rings connected together, from the *Museum* of *Olaus Wormius*, never observed by others; and calls it a Monument of stupendous Antiquity, worthy of the Memory of Posterity. If we compare this with our Curiosity, I know not what should hinder us from pronouncing it to be a BRACELET of the ancient *Prussians*, and no less than *Wormius*'s Bracelet, a Monument of stupendous Antiquity, never observed by others, and worthy of the Memory of Posterity.

It is of a looser Structure than *Wormius*'s Bracelet, so that being worn over the Sleeve, it would embrace the Arms both above and below the Elbow. Nor is it to be looked upon as a vulgar Ornament, because it is made of Copper; for I have not heard of any Gold or Silver ones, that have been digged up amongst us.

Fig. 3, 4.

On account of it's Affinity with this Bracelet, I shall add a Silver Ring, which was found about a Year ago in a *Prussian* Urn, and given me by the Hon. M. *Lilienthal*. It had Threads twisted together in like Manner, to form the Jewel, the rest running out into two Ends, not joined, but lying close together, and forming a Circle, so that it would fit either a larger or smaller Finger.

VII. It is a Wreath of Gold, weighing, as near as I can judge, 9 oz. I believe it is without Alloy, being very pliable; it answers exactly *Virgil*'s Description, *Æn.* V. 558 and 559.

Concerning a
golden Torques
found in Eng-
land, by Sir
Tho. Mostyn,
Bart. No 462.
p. 24. Read
Jan. 28,
1741-2.

*Pars leves humero pharetras : it pectore summo
 Flexilis obtorti per collum circulus auri.*

* In *Schedio de Armillis veterum*, p. 48, 49.

It being joined here with the *Pharetra*, and being very proper for carrying a Quiver, inclines me to think, that the *Gauls*, from whom the *Romans* took it, used it for that purpose; but among the latter it seems to have been worn as an Ornament, rather than a thing of Use. There are several Passages in the *Historians*, which mention it's being given as a Reward for military Service. It is sometimes described as a Chain consisting of several Links; but mine is all one Piece, without any Link or Joints, and takes it's Flexibility from the Pureness of the Metal.

VIII. Since Arts and Sciences, especially Statuary and Sculpture, were arrived at so great Perfection, when the *Roman Empire* was in it's Glory, as the many beautiful Statues, the exquisite *Intaglia's*, and fine Medals, which Time hath handed down to us, do sufficiently evince; it is much to be wondered at, that they never hit upon the Method of printing Books.

The Dies they made for their Coins, and their stamping them on the Metal, was in reality Printing on Metal; their Seals cut in Cornelians and Agats, and their pressing them on Dough and soft Wax, was another sort of Printing; and a third sort was the marking their earthen Vessels, while the Clay was soft, with the Name of the Potter, or the Owner the Vessel was made for. These being of a larger Size, were properly called *Signa*; the Seals cut in Stone were called *Sigilla*; *Sigillum* being a Diminutive of *Signum*, as *Tigillum* is of *Tignum*: But the later and more barbarous *Latinists* have formed the Diminutive of *Signum* into *Signetum*; and if a very small Pocket Seal, they have called it *Signaculum* *.

Description of an Antique Metal Stamp, in the Collection of his Grace CHARLES Duke of Richmond, &c. being one of the Instances, how near the Romans had arrived to the Art of Printing; with some Remarks by C. Mortimer, M. D. R. S. Sec. No. 450. p. 388. Oct. &c. 1738.

Montfaucon in his *Antiquité expliquée*, Tom. III. Partie 2^{de}. Chap. 12. gives us the Figures and Descriptions of several of these larger *Sigilla* or *Signa*, whereon, he saith, the Names were all cut in hollow in capital Letters, *Domini Patronique nomen majusculis literis insculptum*, which he expresses in *French*, *imprimé en creux*; and he imagines their Use to have been to mark earthen Vessels, particularly those great earthen Jars, wherein the *Romans* used to keep their Wines. If any of them had occurred to him with the Letters *excise*, *exsculptæ*, protuberant or standing out, as the Types in our modern way of Printing are made, so accurate a Describer of Antiquities could not have passed such an one over without having mentioned it, and that the rather because of it's being a greater Rarity: tho' several Lamps of *Terra cotta* are stamped with Letters impressed or hollow, from such protuberant Letters as in this Stamp, but the greater Number have the Letters raised, or standing out.

You have here the Figure of one of these last sort of Stamps, where- Fig. 5, 6. on the Letters are *exsculptæ* or protuberant, as is likewise the Edge or Border round the whole Stamp. This Stamp is made of the true

* See *Joh. Mich. Heinocius de Sigillis. Francof. 1709. Fol. p. 16, & seq.*

ancient Brass, and is covered over with a green Scale or Coat, such as is usually seen on ancient Medals. It was found in or near *Rome*. On the Back is fastened a Ring, whereof the Hole is $\frac{27}{40}$ of an *English* Inch one way, and $\frac{23}{40}$ the other way; the Plate itself is two Inches long, wanting $\frac{1}{10}$, and it's Breadth exactly $\frac{33}{40}$ of an Inch: The Sides are parallel to one another, and the Ends are likewise parallel to each other, but they are not upon an exact Square; with the Sides, varying about one Degree and an half from an exact Rectangle. On the under Side stand two Lines or Rows of Letters $\frac{7}{40}$ of an Inch in Height, and well formed *Roman* Capitals: The Faces of them stand up all upon an exact Level with one another, and with the Edge or Border of the Stamp; their Protuberance or Height above the Ground is different, the Ground being cut uneven; for close to most of the Letters the Ground is cut away only $\frac{2}{40}$, close to some near $\frac{3}{40}$, and close to the Edges full $\frac{3}{40}$. The first Line contains these Letters, CICAECILIV, with a Stop or Leaf to fill up the Line; in the second Line, HERMIAE.SN. Which I judge is to be read *Caii Julii Cæcili, Hermiæ Signum*. Who this *Caius Julius Cæcilus* was, I cannot find, he being probably a Man in a private Station, and so his Name hath not been handed down to us in any Monuments, but only accidentally in this Stamp. In *Gruter* occur two of the Name of *Hermias*, and several of the *Cæcili*, but none with these two Names joined together.

The Use of this Stamp seems to have been for the Signature of the above-mentioned private Man, to save him the Trouble of writing his Name, as some People have now-a-days. It was certainly used on Paper or Membranes, being first dipt into Ink, or some sort of Paint, because of the Protuberance of the Letters, the hollow Letters being fitter for soft Substances, on which they leave the Impression standing up, and consequently more legible. Another Argument to me, that this Stamp was not to be used on any soft Substance into which it might be pressed quite down to the Ground, is the Unevenness and Roughness with which the Ground is finished, which, was it to have made part of the Impression, the Workman would have finished with more Accuracy; but he, knowing that the Surface of the Letters was to perform the whole Work required, was only attentive to finish them with that accurate Evenness that these have.

Mr *Maittaire*, in his *Annales Typographici*, *Hagæ* 1719. in 4^{to}. p. 4. concludes from the best Authors, that our modern Art of Printing was first thought of about the Year 1440. A Copy of the Book he mentions, *ibid*. p. 13. called *Speculum nostræ Salutis*, being Pictures of Stories out of the Bible, with Verses underneath, in *Dutch*, I have seen in the *Stad-house* at *Harlem*. Each Page was printed from a Block of Wood, like a sorry wooden Cut; and this was the first Essay of Printing, which Hint was taken from Engraving, and is what he means p. 4. by *Typi fixi*; after which they soon improved to use separate Types, as we now do, which he terms, *ibid*. *Typi mobiles*. This Stamp is, in Reality, a small Frame

Frame of fixt Types, and prints with our modern Printer's Ink, which is only a sort of black Paint, as readily as any Set of Letters, cut in the rude manner these are, can be expected to perform.

We see by this Stamp of two Lines, that the very Essence of Printing was known to the Romans, and they had nothing to do but to have made a Stamp with Lines 3 or 4 times as long, and containing 20 instead of 2 Lines, to have formed a Frame of Types that would have printed a whole Page, as well as Coster's wooden Blocks, which he used in printing the *Speculum Salutis*.

In the first Volume of a Collection of several Pieces of Mr John Toland, printed Lond. 1726. in 8^{vo}. p. 297. is a small Tract of his intituled, *Conjectura verosimilis de prima Typographiæ Inventione*, which is founded upon the following Passage in Cicero, in cap. 20. Lib. II. de *Natura Deorum*; where Balbus the Stoic uses the following Words in an Argument against Velleius an Epicurean:

Hic ego non mirer esse aliquem, qui sibi persuadeat, corpora quædam solida atque individua vi & gravitate ferri; mundumque effici ornatissimum & pulcherrimum, ex eorum concursione fortuita? Hoc qui existimet fieri potuisse, non intelligo cur non idem putet, si innumerabiles unius & viginti formæ literarum (vel aureæ vel quales libet) aliquo conficiantur; posse ex his in terram excussis annales Ennii, ut deinceps legi possint, effici; quod nescio anne in uno quidem versu possit tantum valere fortuna.

He conjectures that this very Passage gave the first Hint to the Inventors of Printing about the Year 1445, because they retained even Cicero's Name for their Types, calling them *Formæ Literarum*, and made them of Metal, as he says, *aureæ vel quales libet*. Moreover, in Cap. 10. Lib. III. de *Divinatione*, Cicero hath the very Phrase *imprimere literas*.

Brands for marking Cattle were in Use in Virgil's Time, Georg. Lib. III. ver. 158. where he says,

Continuoque notas, & nomina gentis inurunt.

Procopius, in his *Historia Arcana*, says, the Emperor Justinus, not being able to write his Name, had a thin smooth Piece of Board, through which were cut Holes in form of the four Letters IVST. which, laid on the Paper, served to direct the Point of his Pen; which being dipt in red Ink, and put in his Hand, his Hand was guided by another. Possibly this may likewise have given the Hint to the first of our Card-makers, who paint their Cards in the same manner, by Plates of Pewter or Copper, or only Pasteboards, with Slits in them in form of the Figures that are to be painted on the Cards.

IX. Two Pieces of Lead are now in the Possession of Sir John Ingilby, Bart. of this Place, which were found, in January last, on Hayshaw-Moore, 2 Miles S. of Patley-Bridge, a small Market-Town in this Neighbourhood, by a Countryman, whose Horse's Foot slipping into a Hole covered with Ling, he dismounted, and thrusting his Stick into the Hole, perceived something hard, and of the Sound of Metal; and, by

Concerning two Pigs of Lead, found near Ripley, with a Roman Inscription on them, by the Rev. Mr Kir-

shaw, No. 459. P. 560. by digging, found these 2 Pieces of Lead, standing upright, and near each other, about 2 Foot under-ground. They are of the same Shape and Dimensions, and have the same Inscription. One of them weighs 11 Stone, the other 11 Stone and one Pound. The Draught is as just a one, as any Person I could meet with in the Country, and at this Time of Year, could take. The Inscription is such as is upon the Leads, to a great Exactness, inso much that every Irregularity of the Letters is noted: Only it may not be amiss to add, that the Letters are raised, and very bold. There have been 4 other Letters on the Side of each of them, whereabouts I have made the Four Dots in the Draught, but they are grown so obscure, that I cannot discover them with any Certainty. — They seem to have been B. N. I. G. . . . The great Roman Causeway leading from *Aldborough*, in this Neighbourhood, into *Lancashire*, passes within a little Way of the Place where the Leads were found. There have been no Lead-Mines, as far as can be known, within some Miles of it: But a Countryman informs me of a large Rock, about $\frac{1}{2}$ a Mile from it, on the Top of which there is an Impression similar to either of the Leads, only so much larger as to admit of a Pan, wherein they might be smelted, if in so early Time they knew the Modern Art of smelting by the Air. As yet, I have not had an Opportunity of viewing this Rock; so that this I have only from hearsay, though I believe it is credible enough.

Camden mentions 20 Pieces of Lead of this Kind, found in *Cheshire*, Part of them with this Inscription, IMP. DOMIT. AUG. GER. DE CEANG. . . . *Camden's Britan.* Fol. Edit. p. 679. — And moreover, that among the Duke of *Parma's* Medals, published by *Paolo Pedrusi*, I do not find any struck in the seventh Consulate of *Domitian*, but what have the Addition of *Divi Filius*, or the like. That Author too says, that the first Year of *Domitian's* being Emperor was the eighth of his Consulate; neither of which agree with the Inscription on the Leads. —

The Dimensions
of the Piece of
Lead.

Fig. 7.

From *a* to *b*. ————— 21 Inches.

d to *e*. ————— 23 $\frac{1}{2}$.

a to *c*. ————— 3 $\frac{1}{2}$.

e to *f*. ————— 5 $\frac{1}{2}$.

Perpendicular Depth 4.

Concerning an
Ancient Date
found at Wid-
gel-Hall in
Hertfordshire,
by Mr John
Cope. No.
439. P. 119.
Oct. &c.
1735.
Fig. 8.

X. I. I send you a Draught of an ancient Chimney-piece (as I was informed it was) found on pulling down Part of *Widgel-Hall* in *Hertfordshire*: There is cut upon it a Date expressed Part in Roman Numerals, Part in Indian Figures; which is the earliest Instance I have met with of the Indian Figures being used here in *England*, viz. *M*. 16. or 1016. that at *Colchester* being in the Year 1090. The Carving is very fair, the Letter *M* and Figures project out above a quarter of an Inch. The whole Chimney-piece is of *English Oak Plank*, and is now very firm, though 718 Years old, and was never painted over; it is 4 Feet

4 Feet 3 $\frac{1}{2}$ Inches long; the Part under the 16 was broken off in taking it down in August, 1733, when the House was on fire.

2. Upon the fourth of April, 1734, a curious Draught of an ancient Date carved in an Oaken Plank, at *Widgel-Hall*, the Seat of *Francis Gulston*, Esq; was laid before an Assembly of the Royal Society, as the most early Instance of our common Figures, usually called *Arabian*, which had ever been observed in *England*. It was read M 16, and thought to express the Year 1016, the M being taken for a Roman Numeral, and the 16 for *Arabian* Figures.

Remarks upon the same, by John Ward, Rhet. Pr. Gresh. and F. R. S. Ibid. P. 120.

Dr *Wallis* had, in the Year 1683, communicated to that learned Body the Draught of a Mantletree, somewhat like this, which he saw at the Parsonage-house at *Helmdon* in *Northamptonshire*, and got it delineated. The Date, which was likewise carved in mixed Characters, expressed the Year M 133, as the Doctor read it. This being the oldest Monument of that Sort, which had then been discovered among us, was published first in the *Philos. Transact.* and afterwards in the Doctor's *Algebra*. Fig. 9.

And in the Year 1700 another Draught of a Date at *Colchester*, which had been sent to Dr *Wallis* by Mr *Luffkin*, who copied it from the under Cell of a wooden Window, and read the Figures 1090, being all *Arabian*, was printed likewise in the *Transactions*, as more ancient than the former.

None earlier than these two last had since appeared, till that from *Widgel-Hall*. Upon the Sight of which, I thought the Reading given to it looked very plausible. The mixed Characters were no just Objection, which Dr *Wallis* had accounted for in the *Helmdon* Date, and I have myself observed in some Manuscripts. But yet one Difficulty seemed to remain, which was the want of some Character in the Place of Hundreds. And therefore soon after going into *Hertfordshire*, I took that Opportunity to wait upon Mr *Gulston*, in order to see the Original; who was so obliging, as not only to shew it me, but also to say, if it would be acceptable to the Royal Society, it should very readily be at their Service. I thanked him for the Offer; and promised, that if he pleased to send it to me, I would deliver it, as from him. Accordingly some Time after it came to my Hands, together with a Letter, giving an Account of the Antiquity of the Building in which it stood. And as that Letter may afford some Light to the Enquiry about the Date cut in the Plank, I take leave to send them both together.

S I R,

I Can give you no further Account of the Antiquity of the Building, than that in general 'twas esteemed ancient. Before the House was burnt, on the Timbers there were several old Coats of Arms; some we looked on as belonging to the Family of the *Scalers*; these were Possessors of

Part of a Letter from Francis Gulston, Esq; to Mr John Ward.

of *Widdibale*, with other Estates, soon after the Conquest. The House, in all Probability, might have been of greater Antiquity, and I believe really was; for at the Time of the Conquest 'twas in the Possession of a considerable Follower of *Harold*.

The Piece of Timber I send you, was the Top of a Door-way, in a Timber-built House, and plastered over with Mortar. From the Date on the plastered Wall, the Door had not been used at least 343 Years; for on the Outside was plainly to be seen the Date 1390. Part of the Room this was found in, was burnt too much to repair again. And in taking down the burnt Timbers, being present myself, I accidentally saw it, and observing the Date, thought it a Curiosity, that might give to the Curious some Speculation. And as such I send it you, and am glad it will be acceptable to so learned a Body of Gentlemen, as the Royal Society. I am,

S I R,

Your most obedient

humble Servant,

Woodbridge in Suffolk,

July the 14th, 1734.

Francis Gullston.

Fig. 10.

Upon considering the Characters on this Plank, and those of the other two Dates mentioned above, together with the Accounts given by learned Men of the Time when the *Arabian* Figures were first introduced into these Parts of the World, and the various Forms they have since received, I was at last satisfied, that none of these 3 Dates prove they were ever used among us, in less than 100 Years after the Reading given to the latest of them. And the Reasons which led me into this Opinion, I now beg Leave to offer, when I have first briefly inquired into their Origin and Antiquity.

Most Writers, who have treated of the Rise of these Figures, have thought they came first from the *Persians* or *Indians* to the *Arabians*, and from them to the *Moors*, and so to the *Spaniards*, from whom the other *Europeans* received them. This was the Opinion of *John Gerard Vossius*,

“ a *Widdibale* in *Hertfordshire*, in the Time of the Conqueror, was Parcel of the Estate of *Hardwin de Scalers*, as appears by *Domesdei Book*, fol. 141.

“ It continued in that Family for several Generations, till it came to *Anthony Widvile*, by the Marriage of the Daughter and Heir of *Scalers*. But when he would not comply with *Richard* the Third to destroy the young Princes, all his Lands were seized, and the Manor continued in the Crown, till *Henry* the Eighth granted it to *George Canon* and *John Gill*: *George Gill*, the Son of *John*, marrying the Daughter of *George Canon*, obtained the whole.

“ In this Family it continued till the Beginning of the Reign of *James* the First, when it was sold to *John Gullston*, Esq; whose Descendants now hold it.” See *Sir Henry Chauncy's History and Antiquities of Hertfordshire*, p. 111.

Vossius^b, Mr *John Greaves*^c, Bishop *Beverege*^d, Dr *Wallis*^e, and many others. And the *Arabians* themselves own they had them from the *Indians*, as both Dr *Wallis*^f and Mr *Greaves*^g have shewn from their Writers.

But *Isaac Vossius* thought the ancient *Greeks* and *Romans* were acquainted with these Figures, and that the *Arabians* took them from the *Greeks*, and the *Indians* from the *Arabians*^h. For the Proof of this he refers to *Tyro* and *Seneca's Notes*ⁱ, and the Treatise of *Boëthius De Geometria*^k. But as to the Notes of *Tyro* and *Seneca*, they seem to have no Affinity with these Figures, either in the Number or Nature of them; for they are not limited to 9, but are many Times that Number, and all different in Form. Nor are they simple Signs of Numbers, but complex Characters of several Letters of those numeral Words which they stand for in the *Roman* Language, like our Short-hands; and therefore vary in their Shape, as they are designed to express Cardinals, Ordinals, or Adverbs of Number. This will appear by the Table of Characters, in which I have given the first ten of each. But as to what *Vossius* says concerning *Boëthius*, I observed in a curious Manuscript of that Writer, now in the Library of Dr *Mead*, nine Characters, which he tells us were invented and used by some of the *Pythagoreans* in their Calculations; while others of them made use of the Letters of the Alphabet for the same purpose. *Boëthius* calls them *Apices vel Characteres*^l. I have inserted these also in the Table to shew the great Affinity between them and the *Arabian* Figures, as these latter were written two or three Centuries ago.

Fig. 10.

The Opinion of *Daniel Huetius* differed from either of the former; for he imagined, the *Arabian* Figures were only the Letters of the *Greek* Alphabet corrupted and altered by ignorant Librarians^m.

From this summary Account of the Rise and Antiquity of these Figures, it seems probable to me, they might owe their Original to the *Greeks* (those common Masters of all Science) and passing from them first to the Eastern Nations, come round to these Western Parts, in the Manner before described. We have no other Author, who speaks of this matter, near so ancient as *Boëthius*, whose Words are very express, and much strengthened by the Similitude of his Characters with the *Arabian* Figures. And therefore we may rather suppose, they took their Rise from these, than from the small *Greek* Letters, with which *Huetius* compared them; since these latter are neither so like them, nor so old as the Time of *Boëthius*. And though what the *Arabians* say may be true, that they had them from the *Indians*, and not the

Indians

^b De Natura Art. lib. III. cap. 8. §. 6. ^c De Siglis Arabum & Persarum. Astronomicis, p. 2. where the Form of them may be seen. ^d Arithmet. Chronolog. lib. I. cap. 5. ^e De Algebra, cap. 3. p. 10. ^f Ibid. p. 9. ^g De Siglis Arabum, &c. ^h Observat. ad Pomp. Mel. p. 64. ⁱ Vid. Grut. Inscript. Vol. II. ad fin. ^k Lib. I. sub. fin. ^l Ubi suprà. ^m Demonstrat. Evangel. Prop. IV. cap. 13. p. 172.

Indians from them, as *Isaac Vossius* conjectured; yet it may be equally true, that the *Indians* had them first from the *Greeks*, and those *Arabian* Writers (who are not very ancient) not have known it; nor are there any *Indian* Monuments of sufficient Antiquity to render this Opinion questionable.

But which soever of these Sentiments may be esteemed the most credible, with respect to the Origin of these Figures; *Joseph Scaliger* thought they were not received by the *Europeans*, as they came of later Ages from the *Arabians*, long before the Year 1300ⁿ.

But *John Gerard Vossius* was of the Opinion they began to use them about the Middle of the thirteenth Century, or the Year 1250^o.

Father *Mabillon*, in his Treatise *De Re Diplomatica*, was necessarily led to attend to the Use of these Figures, particularly in Dates. And he informs us, that they were rarely used before the XIVth Century, except in some few Books of Geometry and Arithmetic. And presently after he says, it was not much to his Purpose to treat of them, since he did not design to carry his Work lower than the XIIIth Century. By which he seems to intimate, that he had met with very few, if any, Instances of *Arabian* Figures, in such Instruments at least, before the Year 1300.

But no one appears to have examined this Subject more carefully than *Dr Wallis*; who has offered some Arguments to prove, that *Gerbertus*, a Monk, who was afterwards advanced to the Papal See, and took the Name of *Sylvester II*, had before the Year 1000 learned the Art of Arithmetic, as now practised, with the Use only of 9 Characters (whatsoever their Form then was) from the *Saracens* in *Spain*, which he afterwards carried into *France*^a. But the Doctor thinks those Characters or Figures were known for a long time after only to such Artists, and principally used by them in astronomical Calculations; the *Roman* Numerals being still retained in common Use to express smaller Numbers. Nor has he given us the Figures used by any of those Writers, before *Johannes de Sacro Bosco*, who died in the Year 1256; and *Maximus Planudes*, a *Greek*, who flourished after him; which I have copied from him, and inserted in Fig. 10.

Mr *David Casley*, in his *Catalogue of the Manuscripts of the King's Library*, &c. has published a Specimen of a Manuscript from the *Cottonian Library*, called *Calendarium Rogeri Bacon*^s, and dated 1292. The Figures in this Book are *Arabian*, and, as Mr *Casley* informed me, the oldest that he remembers to have met with in either of those Libraries: For which Reason I have given them a Place in the Table.

It appeared to me exceeding difficult, how to reconcile the Opinions and Observations of these several Writers, concerning the first Use of

^a Lib. III. Ep. 223.

^o De Natur. Art. Lib. III. cap. 8. §. 7.

Lib. II.

cap. 28. §. 10.

^a De Algebra, cap. 4. p. 17.

^s Ib. p. 11, 15, 16.

^s Plate xv.

the *Arabian* Figures in these Western Countries, with the Time assigned even to the latest of the Dates above-mentioned. And it could not but seem very strange that no Date of any Writing should have been produced in those Figures, or any other Use of them discovered (except perhaps in some mathematical Calculations, or Books of Arithmetic) long before the XIVth Century; and yet that a Date should be found, so carved in a Piece of Wood, before the Middle of the XIIth Century, for so common a Purpose as the Mantle-Tree of a Chimney.

But upon a closer Examination of the Characters, I found Reason to think, this was not really the Case; and that instead of 1133, they ought to be read 1233, what has been taken for a 1, being designed for a 2. This Reading seems to be confirmed by the Shape of the two 33 that follow it, from which, if the bottom Curve towards the right Hand (as it was often made formerly) was taken off, the upper Part would make the 2. Which Agreement between those Figures is not only usual at present, but often found in Manuscripts of the XIVth and XVth Centuries. Though sometimes indeed 'tis otherwise; and the 2 has an Angle at the Top, when the 3 is round, which would not so well have suited this square Hand. The Reason which occasioned the carrying this Date so high, must, I presume, have been the Similitude between the small *i* over the preceding abbreviated Word *Domini* and this 2. But though they appear to have some Likeness, yet there is a manifest Difference between them; for the 2 is much larger at the Top, where it has an Angle, and a Curve downward, that plainly distinguish it from the former. Could it be taken for a 1, I should much rather suppose it was designed for a Letter than a Figure, and the two following Characters for a double *H*; and so the whole to be only an Abbreviation of the Word *millesimo*. But as I think it must be a 2, for the Reasons given already, and do not remember ever to have met with such a double *H*, I can't but esteem the other the true reading. And yet still, I believe, this Date may claim the Preference of being the oldest of the Sort that has hitherto been discovered.

The Antiquity ascribed to the *Colchester* Date, namely 1090, has, it seems, been occasioned by a Mistake in the Copy; for the 0 in the Place of Hundreds should have been made a 4, by drawing down an oblique Stroke on each Side from the Bottom, which makes it 1490, before which Time the 4 had long received that Shape. I am obliged for this information to *James West*, Esq; a worthy Member of this Society, and well skilled in our *British* Antiquities, who himself perceived the Mistake in viewing the Original.

As to the Date from *Widgel-Hall*, which gave Occasion to this Enquiry, it seems to me plainly intended to express the Year 1000, and no more, by the *Roman* *M* in the Escutcheon on the right Side. For the Characters in the other Escutcheon cannot, I think, stand for Figures, but must be the initial Letters of two Names *I. G.* as *W. R.* in the *Helmdon* Date; and were very probably designed in both to denote the

Persons who erected those Buildings. The Omission of a Character in the Place of Hundreds, is still an Argument with me, that these two last were not made for Figures. But what I imagine puts the Matter past all Doubt, is the want of Evidence that the Figure 6 had received that Form till some Ages afterward: And when it was introduced, the upper Part was not at first made so erect, as it is here, but carried in a small Arch just over the Top of the Circle. On the other hand, what looks here like the modern 6, was at that Time the usual Form of the Capital G. This I found fully confirmed by a large Collection of original Grants, made by our ancient Kings and others, and preserved in the Cottonian Library*. Upon consulting these for half a Century at least, both before and after the Year 1016, I found the G so written in a great Number of them, of which the following are some few Instances: N. 37. anno DCCCCIX. N. 35. anno DCCCCXIII. N. 53. anno MXLV. N. 49. anno MLXXXI. For these Reasons therefore I can make no Question, but that Character was designed for a G, and not a 6. And it is plain from other Circumstances in Mr *Gulston's* Letter, that the Building might very probably be as ancient as the Year 1000; which renders this Relic of it, considering how firm and sound it still is, a remarkable Curiosity.

The Use which I think may be made of these Observations is this: That so far as yet appears, any Coin, Inscription, or Manuscript, with a supposed Date before the XIIIth Century, expressed in *Arabian* Figures, may be justly suspected either not to be genuine, or not truly read; unless the Antiquity of it be certain from other clear and undoubted Circumstances, and the Date will bear no other Reading; and if it be a Copy, that it has been taken with Exactness.

Fig. 10.

Fig. 10. contains the several different Characters and Figures referred to in the REMARKS, together with the modern Indian and European Figures.

Fig. 9.

Fig. 9. is the Helmdon Date.

Fig. 11.

Fig. 11. is the Colchester Date.

Some Considerations on the Antiquity and Use of the Indian Characters or Figures; by Mr John Cope, Ibid. p. 131.

XI. 1. The most ingenious Invention of Figures by the sagacious Indians, is of such vast Importance in Numbering, that it can never be sufficiently enough admired, although now-a-days the Use of them is become so familiar among us, that very few consider what a Loss the want of them would be to People of every Degree and Station in Life: For to consider only, that such a Number as not long before the Conquest would take up a good Arithmetician's whole Days to count by the literal Characters, is now by the Help of Figures commonly expressed by a Child in a few Minutes. This Consideration of the vast Use of Figures, put the Learned Dr *Wallis*, and others since him, upon en-

quiring at what Time they were first happily introduced into this Island.

Dr Wallis informs us, that we had the Figures from Spain, into which Nation they were brought by the Moors; the Moors had them from the Arabians; and the Arabians from the Indians. And it was the Doctor's Opinion, that they were first brought into England about the Year 1130; for that the first Instance of their Use which he had met with, was a Date upon a Chimney-Piece, which Date was M 133, the Character M which the Romans made use of to express 1000, being mixed with Figures, as Dr Wallis observes, was often done at their first coming in; since that, is mentioned a Date 1090. all in Figures. About twelve Months ago I produced a Date upon a Chimney-Piece at Widgel-Hall in Hertfordshire, which was M 16, the M for the 1000, being here again mixed with Figures. And I now produce a still earlier Instance of the Use of Figures in England, which is a Draught of an Inscription over a Gate-way at Worcester, built, as 'tis believed, in the Reign of King Edgar, and is this 975. (nine Hundred Seventy-five) which is 158 Years before the Date of Dr Wallis's, 41 Years before that I produced last Year, and is now 760 Years standing. It is a great pity (I think) but it so happened, that the Shape of the Figures in this Date were altered from what they are here shewn to be of, about two Years ago, when the Gate was new chipped and beautified; and at the same Time the modern ones 975 were then painted in their Room, as they are now to be seen; the Ground is Gold, and the Figures black. The Account of this Date I had given me lately by Mr Joseph Douglass of Worcester, who is an ingenious and reputable Person, and lives in the House over the Gate-way on which this Inscription is: He likewise informed me, that his House goes by the Name of *The oldest House in five Counties*; and it is the current Opinion thereabouts, and reported by the ancient People in that Place, That the House was built by King Edgar, wherein they say,—he sometimes kept his Court. I confess I am not so well acquainted with the History of those Times, as to say whether King Edgar either built, or kept his Court there; but all Historians agree that Worcester was then a very considerable Bishoprick; and that Dunstan and Oswald, who were both successively Bishops there in Edgar's Time, were both his great Favourites, especially Dunstan, for whom King Edgar had a very great Regard: For it appears that the first Thing Edgar did after he came to the Crown, was to re-call Dunstan from Flanders, where he had been 13 Years in Exile, and was immediately thereupon made Prime-Minister, Favourite, and Confessor, at first Bishop of Worcester, and afterwards Archbishop of Canterbury; upon which last Promotion his great Friend Oswald succeeded him in the See of Worcester: And 'tis very likely that either Dunstan or Oswald, as having so much Power, Interest, and Riches, might erect a Building there, of which this Gate-way might have been a Part; for as Edgar

Fig. 12.

died in the same Year 975, if we suppose the Date to be fixed upon the Building the Year it was finished, as is now commonly done, *Edgar* could not live or keep his Court there, unless it was in some Part of that Year in which we suppose it to be finished.

I shall next mention some Observations upon the different Shape the Figures have been altered to since their coming into these Western Parts; for our Ancestors wrote them different from the *Indians*, and we again make some of them different from what our Ancestors did, as by the Table will appear.

Fig. 13.

In this Table the Left-hand Column contains the *Indian* Characters; the Middle those used by our Fore-fathers, as appears by old Western Manuscripts; the third are the Characters we now use.

We may now observe that the Figure 1, is the same as the *Indian*; the Figures 2 and 3, are the same with the *Indian*, only placed in a different Position, for the sake of writing them more readily, for only the Dash from the *Indian* 3 is taken away; they are only, as we may say, both set upright. So the Character  of the *Indians* is much the same with ours, only we close the Head, and set it upright, thus 4. Again, our Ancestors transferred the Figure 5 (5) from the Place of 5, to that of 8, and with very little Alteration is our 8 made from it. As the Figure Five was moved into the Place of Eight, so the old Eight  7 was moved into the Place of Seven, the first of these is the 7 of our Ancestors, the last 7 is our own; and as they put the Five for an Eight, they put the six  into the Place of five; which  was at length altered to  *h*, and last of all to 5. The two Characters 9 and 0 are without any Alteration, except that our Ancestors struck a Line cross the Cypher, as thus , which we now leave out, and by that means 'tis restored to it's ancient Form. And now we have no Figure left but the *Indian*  (7) to derive the modern 6 from, to which it seems to have no manner of relation: I shall only observe, that it seems not unlikely to be compounded of the *Indian* 0 (5) and the 1, as thus, 6; for of the two ancient Characters 0   (for five) the 0 is *Indian*, and the  is *Arabian*; this last being nothing more than the *Arabian* Letter  inverted, which in the *Arabian* Alphabet denotes the same Number, and is, as 'tis supposed, used by the *Arabians* only.

The *Roman* Characters have likewise undergone Alterations; for it is found that 1000 was represented by the Antients by this Character , as likewise by ; whence is derived the modern M. for that Number. Also 5000 was represented by , and 50000 by ; and hence the modern Characters  and  for the same Number. We find also in ancient Inscriptions  or  stand for 20, and  for 30, the Letter X being twice expressed in the one, and three times in the other,

other, which the Moderns write single, as XX and XXX, only the Timber-Merchants use the ancient Characters $\times$ and $\times$ to this Day.

2. Upon the 27th of *February* last, I had the Honour to lay before this Society a Paper, containing some Remarks upon an ancient Date, carved in Wood, that was found at *Widgel-Hall* near *Buntingford* in *Hertfordshire*, with the Characters M 16; which had been read 1016, supposed to be mixed Numbers, the M Roman, and the two others *Arabian* or *Indian*, as they are indifferently called. This led me to consider two other Dates of the like Kind, formerly published in the *Philosophical Transactions*; one found at *Helmdon* in *Northamptonshire*, in mixed Characters expressing, as was thought, M 133; and the other at *Colchester*, said to denote the Year 1090, wholly in *Arabian* Figures. But upon searching into the Origin of those Figures, and the Time when they were first brought into these Parts of the World, I could meet with no Examples of them in any Manuscripts, before some Copies of *Johannes de Sacro Bosco* (mentioned by Dr *Wallis*) who died in the Year 1256, which was 123 Years after the latest of the 3 Dates above-mentioned. As it could not therefore but seem very strange, that Workmen should have made Use of those Figures for such common Purposes, so long before they appear in the Writings of the Learned; so upon a closer Examination, and further Inquiry, I found there was no Reason from any of these Dates to suppose, it was really true in Fact. For the *Helmdon* Date instead of M 133, should, as I then shewed, be read M 233; the *Colchester* Date 1490; instead of 1090; and that at *Widgel-Hall* has no *Arabian* Figures in it, the Characters 1 and 6 not being Numbers, but the initial Letters of two proper Names. I G, in the usual Form of those Letters in that Age.

But there has been very lately read before this Society, an Account of a Date at *Worcester*, more ancient than any of the three former; namely, QIV , or 97v, in which the Unit is a *Roman* Numeral, and the other two are taken for *Indian* Figures. I observed in my former Paper, that such Mixtures were sometimes found in ancient Numbers; though in what Manner they were so used, I did not then explain, but for Brevity contented myself with referring to the *Algebra* of Dr *Wallis*, a Book so very well known. The Doctor thought it necessary to take Notice of this, in order to account for his Way of reading the *Helmdon* Date, in which the M only is a *Roman* Numeral. And I had myself met with a few Instances of it in Dr *Mead*'s Manuscript of *Boethius*, as ccc29 and dce68, where the Hundreds are numeral Letters, and both the Decimals and Units *Arabian* Figures*. But it is observable, this is not done promiscuously, but the largest Numbers are always Letters, and the lesser, Figures; as in the *Helmdon* Date. And *Mabillon* has observed, that in a curious manuscript Copy of *Thomas à Kempis*, written

* De Arith. Lib. II.

in the fifteenth Century, some of the Pages are so numbered*. Which Method, so far as appears, was always attended to, and never in any one Instance inverted. So that this *Worcester* Date, which has a *Roman* Numeral in the Place of Units, and the two preceding Characters are supposed to be *Indian* Figures, is not only without Example, but directly contrary to all other Instances of such mixed Numbers. Which Consideration alone might be a sufficient Ground to think, there must be some Mistake in the reading.

Fig. 10.

But the middle Figure, taken for a Seven, is as remarkable; which turning towards the Left hand, forms two obtuse Angles, one above, and the other below. This Shape of the Seven, I believe, was never seen before, and seems by no Means to suit that Age. In the Specimen of the Figures taken from *Johannes de Sacro Bosco*, by Dr *Wallis*, which may be seen in the Table annexed to my former Paper, the Figure Seven is made in this Form Λ , like the two Legs of an isosceles Triangle. And in *Roger Bacon's Calendar*, dated 1292, there is only this Variation; that the Leg to the Left-hand is somewhat shortened, as will appear likewise by the same Table. And this Form continued till Printing was introduced among us; as is evident from *Caxton's Polychronicon*, and other Books printed about that Time. Nor do I find it till later Times in any other Shape; unless that in *Bishop Beveridge's* Table of *Indian* Figures, the two Legs of our ancient Seven are drawn parallel, and arched at the Top, in this Manner $\cap$, instead of meeting in an Angle $\dagger$; and *Planudes*, a *Greek* Writer, has kept the true *Arabian* Form V, like the *Roman* Five, which the *Europeans* inverted. The last Alteration this Figure received among us, was by raising the shorter Leg horizontally. But no Instance of it parallel to this in the *Worcester* Date, or any Thing like it, has before appeared. As there seems therefore no Reason to suppose it a Seven, so I think a probable Conjecture may be offered, what it was designed for, and that is, the *Roman* Numeral Ten, which was made in this Form, like an X; to which Character, in our old square Hand, this supposed Seven γ would very well agree, by supplying only the two extreme Parts to the Right-hand, in this Manner χ , which may easily be thought to have been decayed, and worn away by Length of Time.

As there is no Reason to take the middle Character for a Seven, so neither is there any to suppose the first was intended for a Nine, being thus placed before two *Roman* Numerals, as I take them both to be. It has indeed some Similitude with that Figure; but that is nothing more, than what was anciently, and still is, common to the Letter Θ in that Hand, which resembles a double O, with an oblique Stroke turned inwards from the Bottom of that to the Right-hand; so that if the other to the Left be taken away, that which remains will appear in

* De Re Diplom. Tab. XV.

† Arith. Chron. Lib. I. Cap. 4.

this Form Q, like what is here called a Nine. And every one knows, who has any Acquaintance with ancient Inscriptions, that Letters frequently perish in this Manner, one Part before another.

Upon these Suppositions the true Reading would be MXV. But since the old Date is now destroyed, and modern Figures put in it's Place, this must remain uncertain. And I cannot but think, the former Characters must have been very dark and obscure, for the following Reasons: There is, as I am informed, a Tower over this Gate, of which a curious and learned Gentleman, who lives very near it*, has lately given some Account, in a Treatise intituled, *A Survey of the Cathedral Church of Worcester*. He says, it is "commonly called King John's Tower, and said by some to be built by him; but it was much more ancient, having in the Front of it the Statues of King Edgar, and his two Queens, *Ethelfleda* and *Ethelfrida*; and the Street it leads into, is called in several Writings *Edgar-street* †." Could there be any Room for it's being ever supposed to have been built by King John, while this Date was plain and clear? Or would the Author of the *Survey* have contented himself with only saying, *it was much more ancient*; when he could so easily have given us the Year, had he been satisfied with the Reading? King *Edgar* had been a great Benefactor to the Cathedral Church at *Worcester*, and is said to have given to it 300 Hides of Land ‡; which some compute at so many 100 Acres, but my Lord *Coke* says, an Hide contains no certain Number. *Edgar* died in 975, but his Queen *Ethelfrida* survived him several Years. And as it is not unusual, in order to perpetuate the Memory of publick Benefactors, to erect Statues and other Monuments of them, after they are dead; it might be so in this Case, and the Street receive it's Name (for some Time at least) from this Building, like our *Ludgate-street*. But though the precise Year of this Date cannot, I fear, now be determined with Certainty, it is sufficient to have shewn, that neither the Order of the Characters, their Shape, nor the oldest Examples of *Arabian* or *Indian* Figures, any where found, do in the least countenance the Reading given to it; but, on the contrary, all of them afford the highest Probability, that it cannot be genuine.

I beg Leave only to add, that two learned and ingenious Gentlemen of this Society, *Roger Gale* and *James West*, Esquires, to whose Judgment I would pay a due Regard, were pleased to tell me, they thought the two first Characters, taken for a Nine and a Seven, might probably have been nothing but an ∞; which will bring the Date to 1005, ten Years nearer the Time of *Edgar*. My only Difficulty as to that Reading, is, that the ∞ would then have two oblique Strokes prolonged from the Bottom, one in the Middle, besides the other usual one to-

* Dr *William Thomas*.

† Page 7. See likewise *Hearne's* Preface to *Himings* Chartularium, in the Frontispiece of which Treatise is a Draught of those three Figures.

‡ Account of the Bishops of *Worcester*; by Dr *William Thomas*.

wards the Right-hand, which I do not remember ever to have met with. But as this Inaccuracy might arise from the Obscurity of the Character, or the Imagination of it's being two *Arabian Figures*; I leave it to the Curious to judge either Way, as they please, both Sentiments equally supposing the original Characters of this Date must have been *Roman Numerals*.

I should not have enquired farther into this Subject upon the present Occasion, but that I apprehend it to be a Matter of some Consequence, especially with Relation to Manuscripts. A Copy, for Instance, of some ancient Author, written in the Year 1375, and dated in *Arabian Figures*, by changing only the 3 into a Cypher, may be carried back three hundred Years; or by making it a Nine, and taking out the 1, may be raised still a Century higher, to 975, the supposed Year of the *Worcester Date*. And those, who are conversant with Manuscripts, are sensible, that the Age of them cannot always be determined barely by the Hand. Since therefore *Arabian Figures* are in most Cases much more easily falsified, than *Roman Numerals*; I humbly presume, too great Caution cannot be used, in admitting any Instances of them more early, than have been yet discovered, but upon very clear and sufficient Evidence.

*An Account of
an ancient Date
in Arabian Fi-
gures, upon the
North Front of
the Parish-
Church of
Rumsey in
Hampshire.
By the Rev.
Mr William
Barlow. No.
459. p. 652.
Jan. &c.
1741.
Fig. 14.*

XII. As the knowing how long the *Arabian* or *Indian Figures* have been used in the West, may sometimes be a Means for distinguishing spurious from genuine Dates; so a wrong Hypothesis, fixing the Time later than it ought to be, may possibly induce us to suspect genuine Dates to be doubtful or spurious. To give some Light to this Subject, I have here sent a Draught of Part of the North Front of the Abbey (now Parish) Church of *Rumsey*, in the County of *Southampton*, with an Inscription on the same. That this Inscription is a Date, 1011, is evident from the Figures. That it is a genuine Date, the apparent Antiquity of the Building plainly demonstrates. A spurious Date in this Place would have expressed the Time when the Abbey was founded by King *Edward*, Grandfather of *Edgar*, above a 100 Years before the Time here mentioned.

There is something very remarkable with relation to the Time when this Church was built. Not only during the Year of this Date, 1011, but for several Years before, many Parts of *England* were laid waste by the revenging *Danes*, justly incensed against the *English* by the inhuman Massacre of their Countrymen in the Year 1002. The *Saxon Chronicle*, p. 141, acquaints us, that the County of *Hants*, *Hamton-rcipe*, among others, was miserably harrassed by these cruel Invaders this Year of the Date *. It is therefore very extraordinary, that so fine a Pile (according to the Age when it was built) should be raised at a Time when every Thing else, sacred and civil, was plundered and destroyed

* *Florence of Worcester* also observes the same. . . *Suthamptonens, Wiltunens* . . . *provinciis . à Danorum exercitu ferro flammaque demolitis.* *Ad An. 1011. p. 613.*

THE HELMDON DATE.



Fig. 8.



Fig. 9.

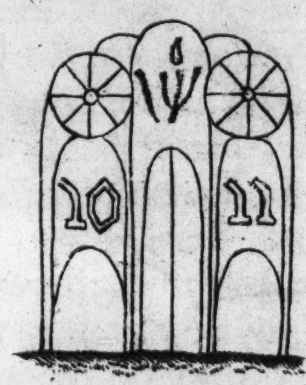
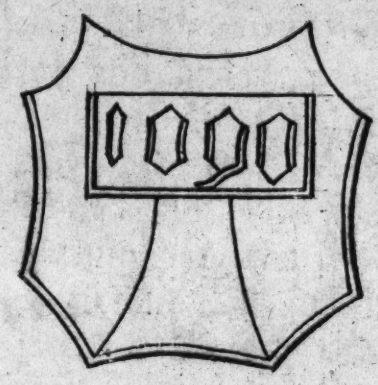


Fig. 14.

THE COL



CHESTER DATE.

A TABLE OF CHARACTERS.

Fig. 10.

	unus	duo	tres	quatuor	quinque	sex	septem	octo	novem	decem	
	↵	↵	↵	↵	↵	↵	↵	↵	↵	↵	
	primus	secundus	tertius	quartus	quintus	sextus	septimus	octavus	nonus	decimus	
	↵	↵	↵	↵	↵	↵	↵	↵	↵	↵	
Tyro and Seneca's Notes:	semel	bis	ter	quater	quingies	sexies	septies	octies	nonis	decis	
	↵	↵	↵	↵	↵	↵	↵	↵	↵	↵	
Boethius's apices.	I	↵	↵	↵	↵	↵	↵	↵	↵	↵	
Small Greek letters.	α	β	γ	δ	ε	ζ	η	θ	ι		
Modern Indian Figures.	q	↵	↵	↵	↵	↵	↵	↵	↵	↵	
Arabic figures.	1	↵	↵	↵	0	4	↵	↵	1		
Figures of Jo. de sacro Bosco.	1	↵	3	↵	4	6	↵	8	9	10	
Figures of Max. Planudes.	1	↵	↵	↵	↵	4	↵	↵	9	10	
Figures in Reg. Bacon's Calendar.	1	7	3	↵	4	6	↵	8	9	10	
Modern fig	1	2	3	4	5	6	7	8	9	10	

From, Gruter's Antiquitat Vol. II. in fin.

Doctor Mead's Manuscript

Tavernier Liv. 1. chap. 2.

Manuscripts.

Doctor Wallis.

The Cotton Library.

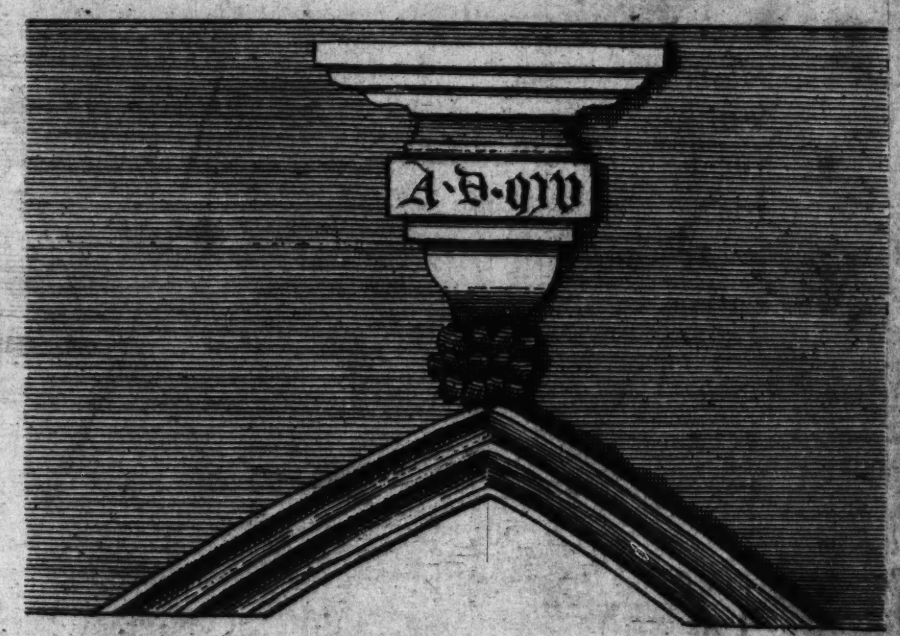


Fig. 13.

Indian	Antient	Modern
1	1	1
u	2	2
w	3	3
↵	4	4
08	45	5
47	6	6
↵	1	7
17	8	8
9	9	9
0	0	0

by these merciless Ravagers. But probably the Devastation was not quite so general as represented.

If this be a genuine Date, (and I see no Reason to question it) it is, I believe, the ancientest, *Indian*, or other, that has yet been taken Notice of in *England*, perhaps in *Europe*; and quite destroys the Opinions advanced by *Scaliger*, *Vossius*, *F. Mabillon*, *Dr Wallis*, and other learned Men, concerning this Matter.

Now I have mentioned this Abbey of *Rumsey*, I take Leave to correct an Error in *Sir H. Savil's* (the only extant) Edition of *Roger Howeden*, *Frankf.* 1601, p. 426, Anno 967, Rex . . . *Edgarus* in *Monasterio Rameseie*, quod Avus suus *Edvardus senior* construxerat.—Here it is called *Rameseie*, by Mistake, for *Rumeseie*; and again in the same Page. But *Rameseie* was *Ramsay* in the County of *Huntington*, a Monastery founded by *Oswald* Bishop of *Worcester*, afterwards Archbishop of *York*, consecrated by the said *Oswald*, An. 991†. This Identity of Name, unobserved, may occasion great Confusion in the History of these two Places. I find *F. Cressy* (p. 860.) or the Authors he transcribed from, misled by this typographical Error. Possibly others may fall into the same Mistake, by the same Means. It is Pity there is not a more correct Edition of that Author.

XIII. 1 Dijs Manibus
2 Marci Herennij
3 Proti, vixit annos viginti duos
4 Menses duos, Dies quinque, fecerunt Parentes
5 Marcus Herennius Agricola et
6 Herennia Lacena Filio.
7 Chirographum. Ollaria numero quatuor
8 Cineraria quinquaginta tria intransibus par-
9 te laeva quæ sunt in monumento
10 Titi Flavij Artemidori, quod est Viâ
11 Salariâ in agro Volusi Basilides
12 Ientibus ab Urbe parte sinistra, Do-
13 nationis causâ Mancipio accepit
14 Marcus Herennius Agricola de Tito Flavio
15 Artemidoro Sestertio nummo Uno, Libripende Marco
16 Herennio Justo, Antestatus est Tiberium
17 Julium Erotem: Inque vacuum
18 Possessionem earum ollarum
19 Et Cinerariorum Titus Flavius Arte-
20 midorus Herennio Agricolæ ire
21 Aut mittere, ossaque inferre per-
22 misit, sacrumque quotiens face-
23 re vellit Herennius Agricola
24 Heredesve ejus permisit, Clavisve

A Copy of an ancient Chirograph, or Conveyance of Part of a Sepulchre, cut in Marble, lately brought from Rome, and now in the Possession of Sir Hans Sloane, Bart. R. S. Pr. with some Observations upon it by Roger Gale, Esq; V. P. R. & Tr. R. S. No. 441. p. 211. Apr. &c. 1736. Fig. 15.

- 25 Ejus monumenti potestatem factu-
 26 rum se dixit, dolumque malum
 27 Huic rei abesse afuturumque
 28 Se hæc rectè Dari, fieri præstari
 29 que stipulatus est Marcus Herennius
 30 Agricola, spepondit Titus Flavius
 31 Artemidorus. Actum 18^o Kalendas Januarij
 32 Caio Calpurnio Flacco, Lucio Trebio
 33 Germano C O S.

This Marble, lately arrived from Rome, and now repositèd in the noble Museum of Sir Hans Slaane, is a most valuable Piece of Antiquity, as exhibiting a compleat *Formula* of a *Chirograph*, or Conveyance of one Part of a Burying-Place from one Family to another, but neither of them of any Note, seeming by their *Agnomina* to have been only *Liberti*, or descended from such. *Agricola* indeed is a Roman Name, but those of his Wife *Locena*, and his Son *Prætor*, are both Greek.

By this *Chirograph* (Line 7th, 8th, &c.) *Herennius Agricola* obtains from *Titus Flavius Artemidorus*, a Right to four *Ollaria*, which were *Niches* or *Repositories*, wherein they placed *Cineraria*, *Urns*, or *Vessels* of Stone, or *Earth*, containing the Ashes of the Dead, and were here in Number fifty-three.

Fabretti * indeed takes the *Cineraria* to have been *Niches* for receiving and keeping *Urns lapideas*; but *Guthenius de Jure Manum* (Lib. II. c. 24.) tells us, that *Ossuaria olle à Cinerarijs in se differunt, quod hæ Cineres, illæ ossa exciperent*. Besides, if they were *Niches*, or the same as *Ollaria*, the mentioning of *Dem*, as in this Inscription, would be an unintelligible Tautology; and *Span* (in his *Miscell. Antiq. Erudit.* p. 290.) gives us the following Inscription, which seems to put the Matter out of Dispute.

Rome, in *Opæculo Vasis*.

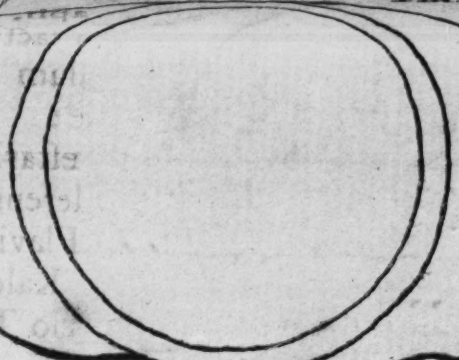
CINERARIIVM

GEMELL. III. AELI

MARCI ET PHILIPPI

From both which Authorities it is evident, that the *Cineraria* were *Vasa*, and not *Repositories* for them.

This Monument was situated on the left Side of the *Via Salaria*, which ran to the N W of Rome from the *Porta Collina*. It stood in the Ground of *Volusius Basilides*, and the Consideration for the Conveyance of it is one *Sefterce*. It is very usual in sepulchral Inscriptions to find the Monument of one Family in the Field of another, the Proprietor of the Monument reserving the Right of that to himself when he sold the Ground; or purchasing so much Ground from the Owner as



D M

M·HERENNI·
PROTIV·A·XXII

MII DV SECERVNT PARENTES
M HERENNIVS AGRICOLA ET
HERENNIA LACENA FILIO
CHIROGRAPHVM OLLARIAN IIII
CINERARIAN·LIII·INIRANTIBVS PAR
TE LAEVA QVE SVNT IN MONVMENTO
T·FLAVI ARTEMIDORI QVOD EST VIA
SALARIA IN AGRO VOLVSI BASILIDES
IENTIBVS AB VRBE PARTE SINISTRA DO
NATIONIS CAUSA MANCIPIO ACCEPIT
M·HERENNIVS AGRICOLA DE T·FLAVIO
ARTEMIDORO TTS N·T LIBRI PENDE·M·
HERENNIO IVS TO ANTES TATVS EST I
IVLIVM·EROTEM INQVE VACVAM
POSSESSIONEM FARVM OLLARVM
ET CINERARIORVM T·FLAVIVS ARTE
MIDORVS HERENNIO AGRICOLE IRE
AVT MITTERE OSSA QVE IN FERRE PER
MISIT SACRVM QVE QVOTIENS FACE
RE VELLIT HERENNIVS AGRICOLA
HEREDES VE EIVS PERMISIT CLAVIS VE
EIVS MONVMENTI POTESTATE M·ACTV
RVM SED DIXIT DOLVM QVEM ALVM
HVIC REI AB ESSE AVTVRVM QVE
SE HAEC RECTE DARISERI PRAESTARI
QVESTIPVLATV SEST·M·HERENNIVS
AGRICOLA SPEPONDIT·T·FLAVIVS
ARTEMIDORVS ACT·XVIII KIANVAR
C·CALPVRNIO FLACCO T·TREBIO
GERMANO C·S

rp[®]

was sufficient for erecting the Monument. All Sepulchres, when once a Body was interred therein, were esteemed as religious and sacred, and were not to follow the Possession of the Field.

Mille pedes in fronte, trecentos cippus in agrum

Hic dabat, Heredes monumentum ne sequeretur.

Hor. 1. Sat. 8.

Line 11. *Basilides* is a Blunder for *Basilidis* in the Genitive Case; and we shall meet with more of them before we get through this Inscription.

Line 11, 12. The Words *Donationis causa mancipio accepit M. Herennius Agricola de Tito Flavio Artimedoro* $\overline{\text{HS N. I.}}$ are to be read *Sestertio Nummo Uno*, as is evidently demonstrated from the following Inscription, where you have also the rest of the Words of this Form of Conveyance. There is likewise in *Gruher* * an Inscription, wherein the Words *SESTERTIO NUMMO UNO* are expressed at Length.

HOC MONUMENTVM. SIVE
SEPVLCHRV. CVM. AREA. SVA
T. FVFCIVS. FELIX. DE
IVLIA. RVFINA. DONATIONIS
CAVSA. MANCIPIO. ACCEPIT
 $\overline{\text{HS N. VNO. QVOD. COMPARAVIT}}$
FVFCIAE. AMPLIATAE
CONIVGI CARISSIMAE, &c.

They were *Verba solennia Donationis vel Alienationis causa quae fiebat per Mancipium*. This Mancipation was often a fictitious Sale of a Thing to make the Donation of it valid, as in this Case: And the Mention of one Sesterce given for it, is only *Dicis gratia*, much like our Form in Leases for putting into Possession, *In Consideration of five Shillings in Hand paid*. Frequent Examples occur of this Practice, as in the Inscription just now quoted from *Fabretti* †, and others in the same Author; and in *Gruher* (p. DCCCCLVI. 4. and MLXXXI. 1.) which latter is a compleat Formula of a like sepulchral Conveyance as this, but of a later Time, and not so well preserved; it being executed when the Emperor *Trebonianus Gallus*, and his Son *Volucianus*, were Consuls, A. D. 252; and ours probably, as will be shewn hereafter, during the Reign of *Septimius Severus*.

Line 15.) *LIBR J PENDE* is cut in our Marble as two distinct Words, as here represented, though in Reality it should be but one, and signifies the Person that weighed or counted over the Money to the Seller: It should be read *LIBRIPENDE*, than whom there could not

* P. DCCCCLVI. 4.

† Inscript. ant. in ad. pat. p. 50.

Be a more proper Witness to the Purchase. At the Beginning of the Roman State, their Money was uncoined, and called *Æs rude*, or *græce*, therefore paid by *Weight*; whence comes the Word *Libripens*. Under *Servius Tullius*, their sixth King, it begun to be coined, and paid by *Tale*; but the Person who counted it over to the Receiver, still retained his primitive Appellation. Almost every considerable Town had it's *Libripendes*, Persons of Skill in Money-Affairs, to determine Controversies about the Value of it.

An Inscription in *Gruter* (p. mxcv. i.) is a strong Evidence of this: It was found at *Nola* in *Campania*, and shows they had two *Libripendes* there appointed by publick Authority.

T. VEDIVS. T. F.
T. VITORIVS. CN. F.
II. VIRI
LIBRIPENDES
EX. DD.

This Name they had, *Quia librām aneam tenebant quā nummos penderent.*

— *Libra mercatus & Ære.* Hor. Epist. II. 2.

And hence we have the Words *Stipendium*, *Dispendium*, *Expense*, and the like. In *Apuleius's Metamorph.* Book Xth, is the following Passage: — *Sed ne fortè aliquis, inquam, istorum quos offers Aureorum, Nequam vel Adulter reperiatur, in hoc ipso sacculo conditos eos annulo tuo prænota, donec altero die Nummulario præsentē comprobentur*, where this *Nummularius* seems to be the same as the *Libripens*, who was generally called in to count over and examine the Money at Payments for Purchases, though sometimes a private Person or Friend to the Parties might probably perform this Office for them, and be an Evidence, upon Occasion, to the Facts: To which End also they used to adhibit another Witness, as *Herennius Agricola* does here, who was one *Tiberius Julius Erotes*, and sometimes they added five more. The Form and Manner of doing it, was by asking a By-stander, *Licetne antestari?* If he consented, the Demandant touched, or pulled, the lower Part of his Ear, as a Memorandum of what passed; whence *Horace* in his IXth Satire,

— — — *casu venit obviu*s* illi*
Adversarius, & quo tu turpissime? magnā
Exclamat voce, & Licet Antestari? ego verō
Oppono Auriculam — — —

By the Law of the XII Tables, if he that was called to testify in this Manner, or the *Libripens* refused afterwards to give his Evidence in the Case, they were adjudged infamous. *A. Gel. l. xv. c. 14.*

Line

Line 18.) *EARVM OLLARVM* seems to be a Mistake for *EORVM OLLARIORVM*.

Line 20 to 27.) are Covenants usual upon this Occasion, as may be seen in the like sepulchral Contracts, particularly the before-mentioned in *Gruter* (p. *MLXXXI. 1.*) and many other Donations and Orders about Monuments in his voluminous Collection; as also in *Fabretti*, and *Reinesius*.

Line 28.) *SE* seems to have been a Blunder of the *Marmorarius* for *SIBI*, *SE DARI* being perfectly ungrammatical. But in the Contract aforesaid, given us by *Gruter*, the Words run, *De ea re dolum malum abesse, afuturumque a te, Hærede tuo, & ab his omnibus ad quos ea res pertinebit, hæc SIC rectè dari, fieri, præstarique stipulatus est*; which inclines me rather to believe, that *SE* in ours ought likewise to have been *SIC*: There are many palpable Mistakes in it, as I have before observed, as in Line the 23d *VELLIT* for *VELIT*, and *CLAVISVE* for *CLAVISQVE*, in the 24th.

The Roman Lawyers tell us, that *Stipulatio erat Interrogatio certis, solennibusque verbis concepta; & apta, consentaneaue responsio, veluti spondes? spondeo. Dabis? Do.* This is fully confirmed both in ours, and the *Gruterian* Contract, (p. *MLXXXI. 1.*) *Stipulatus est Marcus Herennius Agricola: Spondit T. Flavius Artemidorus*: In the latter. *Stipulatus est Licinius Timotheus: Spondit Statia Irene*. The learned Mr *Mattaire* observes from *Aulus Gellius* (Lib. vii. c. 9.) that ancient Authors used *e* instead of *o*, in those Verbs which have a Reduplication [in *præterito tempore*] as *memordi, peposci, spondi*, for *momordi, poposci, spopondi*, used by more modern Writers; so that *SPEPONDIT* is no Mistake, but an Archaismus, as may be the Word *IENTIBVS* in the 12th Line; though it has not had the good Fortune to have been remarked, as the latter. *Iens* in the Nominative Case was used more than once by *Cicero*; and though he declines it, like all other Authors now in being, *Euntis, Eunti, &c.* yet it might originally have been declined *Ientis, Ienti*; but as there is now no Authority extant to warrant it, this must pass as meer Conjecture.

Line 32.) There are no such Names to be found in any of the *Fasti Consulares* as *C. Calpurnius Flaccus* and *Lucius Trebius Germanus*; so they must have been not the *Consules Ordinarij* of the Year, but *Suffecti*. It is very strange that the Romans should so long adhere to this troublesome and uncertain Method of Computation by Years of their Consuls, since they had frequently several Pairs of them in the same Year, especially after they fell under the Imperial Government. Some reckoned by the ordinary Consuls, who came into their Office upon the first of January, about 600 Years after the building of Rome; for 'till that Time the Month of their entring upon that Dignity was not fixed; and others computed by the *Suffecti*, who might come in several Months after, as Vacancies happened, or as they were appointed by the Emperor, tho' their Names were seldom inserted in the *Fasti*. Besides this, it was impossible.

impossible for any Man to remember how many Years were elapsed from the present Time upwards, to such and such Consuls, without Tables of their Succession, or having Recourse to some other Era, as the A. V. C. *anno Urbis conditæ*, which they do not seem to have much regarded.

In *Gruter* (p. XLVI. 9.) is a long Inscription, mentioning TREBIVS GERMANVS, (though not as Consul,) in the Reign of *Septimius Severus*; and another (p. CCCCLXXXII. 7.) of C. CALPVRNIUS FLACCVS: If these Men were the Consuls here referred to, as they might be, the Age of our Marble will be ascertained within a few Years.

The Stone is turned with an Arch at Top; the whole Length of it is 27 Inches and a half; the Breadth at the Bottom of it is $10\frac{1}{2}$ Inches, and at the Base of the Arch $12\frac{1}{4}$ Inches, it widening gradually upwards. The Letters are cut in a small indifferent Character; that of the E and the F are remarkable, being always formed in this manner E. f.* It was probably placed over or between the 4 Niches, or OLLARIA granted to *M. Herennius Agricola* in this Monument by *T. Flavius Artemidorus*, in order to declare and assert the Right and Possession of them to the former, and his Family, 'till they were all filled.

An Explana-
tion of the Ru-
nic Characters
of Helsing-
land, by Mr
Andrew Cel-
sius, R. S.
Succ. Secr.
F. R. S. and
Prof. Astron
at Upsal. No.
445. p. 7.
Jan. &c.
1737.
Fig. 16.

XIV. 'Tis well known, that there are Stones found in the several Parts of Sweden, which were formerly set up as Obelisks in Memory of the Dead. These Monuments are marked with the ancient Northern Letters, called *Runor* (or *Runic Characters*). But there is one Province of North Sweden, namely *Helsingland*, where five of those Stones occur, which have Characters cut into them, that seem to differ from the common *Runic*. Upon the Introduction of our modern Letters, these *Runic Characters* became so little regarded, that their Interpretation was lost even to the Antiquarians of our Country till the Year 1674; when my Grandfather *Magnus Celsius*, then Professor of Astronomy in the University of *Upsal*, revived their Reading, and drew up an Alphabet of them, ranged after the manner of the Ancients. There are but 16 Letters, and the Words are frequently distinguished either by 3 Points set perpendicularly over one another, or by two at some Distance asunder.

Among the several Alphabets hitherto known, it would be a hard Matter to find one like the above-mentioned; if we may not perhaps except the Characters of the *Persepolis* Inscriptions, which have not as yet been decyphered. For the Letters generally made use of signify different Sounds, according to their various Shapes: Whereas in this Alphabet the same Character often denotes a different Sound, according to the Diversity of it's Place and Attitude between the two Parallels. Thus a strait Stroke, standing perpendicular to the parallel Lines, signifies I, F, D and S. For when it joins these Parallels, it signifies I; when it rests on the lower Parallel, it signifies F; on the upper S; and D, when it touches neither of them. The small Wedge leaning to

* As will appear by examining the engraven Copy of it Fig. 15. which is taken very exactly to all the Dimensions by a Scale of half the original Size.

the Right, and placed near the upper Parallel, denotes L; in the middle, N; and O, near the lower. A Line descending from the upper Parallel, and making a Curve downward to the left, stands for K; the same placed contrarywise, from the lower Parallel upward, expresses R: And so of the rest.

The Intention of the first Inventor of these Letters seems to have been, to form all the Characters of small Wedges, strait and crooked Lines, and two Points, variously placed between the two Parallels. For the Wedges may be placed 15 different ways; as in Fig. 17. The strait Line may also have 15 different Situations, as in Fig. 18. The crooked Lines can likewise be varied 14 different ways, as in Fig. 19. In fine, the two Points admit 12 Variations, as in Fig. 20. But as the ancient *Sueo-Gothi* had but 16 Letters in their Alphabet, they did not want all these Variations of the Wedges, Lines, and Points: Wherefore they employed 6 Variations of the Wedges; of the strait Lines, 5; of the crooked, 3; and but 2 of the Points.

If we now suppose these *Helsingic Characters* to be older than the common *Runics*, the greatest Part of the common *Runics* can easily be derived from the *Helsingics*, by adding a perpendicular Line to the small Wedges and Curves; as appears in Fig. 21.

But if we suppose the common *Runics* to be older, and to be derived, as it is very probable, from the ancient Greek and Roman Letters; we must, in the contrary way, deduce the *Helsingic Characters* from the common *Runics*, by subtracting the perpendicular Line.

As a Specimen, I beg Leave to lay before this Society a Stone found at *Malstad*, a View of which is represented in Fig. 22, and the Reading in Fig. 23. I took an exact Copy of it in the Year 1725, in Company with my Uncle, the Rev. Dr *Olave Celsius*, of whom we expect a compleat Account of all these *Helsingic Inscriptions*; the Reading in *English* is thus:

Frumunt erected this Stone to Fifiulfi the Son of Brisi: But Brisi was the Son of Lini. But Lini was the Son of Un. But Un was the Son of Fah. But Fah the Son of Dari. But he (the Son) of Barlaf. But he the Son of Drun: But he (the Son) of Lanäs: But he (the Son) of Fidrasi. Frumunt the Son of Fifiulfi made these Runic [Letters.] We have placed this Stone to the North of Bala Stone. Arva was the Mother of Fifiulfi. Sialfir (or Fifiulfir) was the Governor of this Province. His Place of Abode was in Rimbium.

That this Monument was erected since Christianity began to flourish in Sweden, sufficiently appears by the Figure of the Cross. Moreover, 'tis probable that *Fifiulfi*, as the Governor of the Province, was descended of a very noble Family; seeing his Genealogy is traced 10 Generations backward. Now if we suppose *Frumunt* to have been 30 Years of Age when he erected this Monument for his Father, and, with Sir

Remains of a City, Statues, and Pictures found under-Ground.

Sir I. Newton, allow 30 Years for each Generation; we shall find 330 Years from the Death of *Fisulfi* to the Birth of *Fidrasio*, who is the Stock of these Generations.

This Stone is published in M. de la Moiraye's Travels; but with considerable Errors in the Windings of the Snakes, and in the Letters, as well as in the Explanation given to them.

An Account of the Discovery of the Remains of a City under-ground, near Naples; communicated to the Royal Society by William Sloane, Esq; F. R. S. No. 456. p. 345. dated Naples March 7. 1731-2.

XV. At *Resina*, about 4 Miles from *Naples*, under the Mountain, within half a Mile of the Sea-side, there is a Well in a poor Man's Yard, down which about 30 Yards there is a Hole, which some People have the Curiosity to creep into, and may afterwards creep a good way under-ground, and with Lights find Foundations of Houses and Streets, which, by some it is said, was in the Time of the Romans a City called *Aretina*, others say *Port Hercules*, where the Romans usually embarked from for *Africa*. I have seen the Well, which is deep, and a good Depth of Water at the Bottom, that I never cared to venture down, being heavy, and the Ropes bad. This City, it is thought, was overwhelmed by an Eruption of the Mountain *Vesuvius*, not sunk by Earthquakes as were *Cuma*, *Baia*, *Trepergola*, &c. Signed,

William Hammond.

Rome, Nov. 20. 1739.

Extracts of two Letters from Sig^r Camillo Paderni at Rome, to Mr Allan Ramsay, Painter, in Covent-Garden, concerning some ancient Statues, Pictures, and other Curiosities, found in a subterraneous Town, lately discovered near Naples. Translated from the Italian by Mr Ramsay, No. 458. p. 484. Sept. &c. 1740.

XVI. I. I told you in one of my former Letters, that the King of *Naples* had made a Discovery of a subterraneous Town at *Portici*, a small Village at the Foot of Mount *Vesuvius*; and that our old Friend Sig^r *Gioseppe Couart*, as Sculptor to the King, had the Care of the Statues found there, with Orders to restore them, where they are damaged. Within these few Days he is returned hither to settle his Affairs, and has informed me of some of the Particulars, in such a manner as very much incites my Curiosity, and Desire of communicating them to the Publick, by making Designs of them on the Spot. He tells me, they enter into this Place by a Pit, like a Well, to the Depth of 88 *Neapolitan Palms**; and then dig their Way (after the Manner of our *Catacombs*) under the bituminous Matter, thrown out of the Mountain in the Time of great Eruptions, and called by the People of the Country, the *Lava*, which is as hard as a Flint. And when they meet with any thing that seems valuable, they pick it out, and leave the rest. But I am afraid, that after they have searched, they throw the Earth in again; by which means many Curiosities may be lost, not being understood by these Labourers. They have already found the following Things:

An Amphitheatre, with it's Steps.

An Equestrian Statue, but all broken to Pieces.

A Chariot and Horses of Brass, which have had the same Fate.

A large brassen Dish, said to be found in a Temple.

* A *Neapolitan Palm* contains near 9 Inches.

They

Fig. 16.



Fig. 17.



Fig. 18.

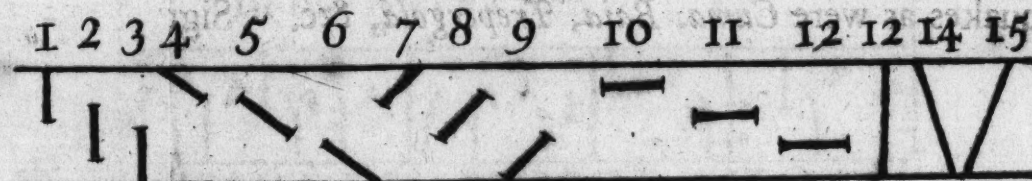


Fig. 19.

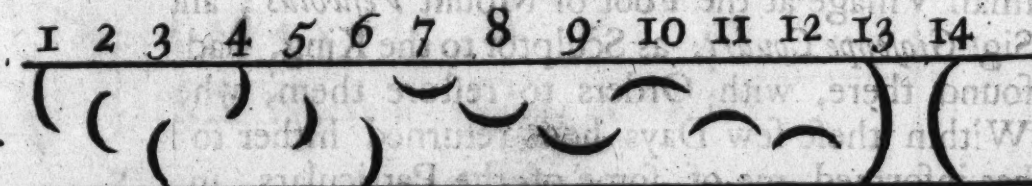


Fig. 20.



Fig. 21.



On the outward Limb or Border.

Fig. 22.

FRUMUNT FST STAINA DINA FTIR

FISIULEA BRISA SUN IN BRISIVASLINA

SUN IN LINI VAS UNAR SUN; INUNVAS

FAH SUN; IN FAHA DURI SUN.

Fig. 23.

In the first Curvature.

IN DA BARLAF; IN DA SUDRUNAR

In the second Snake.
Dragon.

IN DA LANASR; IN DA FIDR ASTV

In the inner Limb.

FRUMUNTEFISIULEA SUN FADIRUNARDISAR VIRSUTUM

ST IN DINA NURI BALASTIN

In the second Curvature.

AR VAVAS MUDIR FISIULFI

In the first Snake.

STU LFIR VARD UM LANTIDISURI VISR.

In the Heads of the Snakes.

SIN VANU IN RIMBIUM



They have also dug out many other Bronzes, with several Statues and Bas-relieves, which Sig. Gioseppe is now restoring.

There have been found likewise 8 Rings with their Cornelians engraved, and a Bracelet of Gold.

And they have already taken up about 30 or more Pieces of ancient Painting, some of which are exceeding beautiful.

Sig. Gioseppe gave me a Note of the Pictures, but as it is in *Spanish*, and writ in a very bad Hand, I cannot pretend to transmit it to you; but choose rather to defer it, till I have seen them myself, which shall be as soon as I have finished a Piece of Work I am now about, &c.

Rome, Feb. 20, 1740.

2. As soon as I arrived at *Naples*, Sig. Gioseppe met me, and carried me to *Portici*. The first Thing he shewed me was the Pictures they had dug out, such as never were seen in our Days; and were you to see them, you would be surpris'd as much as I was; for you would see Paintings finished to the highest Pitch, coloured to Perfection, and as fresh as if they had been done a Month ago.

Particularly one Piece, 8 Palms broad by 9 high, the Figures as big as the Life, representing *Theseus* after having killed the *Minotaur*, which is wonderfully fine. You see the Figure of *Theseus* naked and standing, which, in my Opinion, cannot be more properly resembled to any other Thing, than the *Antinous* of the *Belvidera*, both for the Attitude and Air of the Head. It is drawn and coloured with prodigious Elegance. The *Greek Boys*, who are represented as returning him Thanks for their Deliverance, seem, for their noble Simplicity, the Work of *Dominichino*; and the Composition of the whole is worthy of *Raphael*.

Another Piece represents *Chiron* teaching *Achilles* to touch the Lyre.

Another large one, like that of *Theseus*, the Figures as big as the Life; but we could not comprehend the Design of it. You see a Woman dressed in White sitting, with one Hand resting on her Head, adorned with a Garland of Flowers, and several Deities (as they appear to me) in the Air, with a black Figure of *Hercules* leaning upon his Club. This Figure is not of a Piece with the rest, which are really Prodigies of the Pencil; but yet it is a fine Picture. Under the Woman is a Deer, which gives Suck to a Child. But was you to see this sitting Figure, and the Heads of those whom I take to be Divinities, how finely they are drawn and coloured, you would be astonished.

Two other Pieces of greater Height than Breadth, in which there are two Figures, half human and half Fish, which fly in the Air.

Four Landskips, with Temples and other Buildings.

Another Figure, which we think to be *Mercury*, with a Child in his Hand, delivering it to a Woman sitting.

A *Tyger*, with a Boy upon it; and another Boy, who plays on a *Tympanum*: With many others.

Remains of a City, Statues, and Pictures found under Ground.

After having viewed all these Things, which are already taken out, I went down into the Pit. The Part where they are at work, must have been a stupendous Building; and without Doubt one may conjecture it to have been an Amphitheatre, by the Circumference of the Walls, and the large Steps, which are still preserved. But it is impossible to see the Symmetry of the whole, because one must travel through streight Passages, like our *Catacombs* in *Rome*. After having gone a good Way under-ground, I arrived at the Place in which the Paintings had been discovered, and where they are daily discovering more. The first Mistake those Men they call Intendants have committed, is, their having dug out the Pictures, without drawing the Situation of the Place, that is, the Niches, where they stood: For they were all adorned with Grôtesques, composed of most elegant Masques, Figures, and Animals; which, not being copied, are gone to Destruction, and the like will happen to the rest. Then, if they meet with any Pieces of Painting not so well preserved as the rest, they leave them where they found them. Besides, there are Pillars of *Stucco* extremely curious, consisting of many Sides, all variously painted, of which they do not preserve the least Memory. But what is most curious, is to see these Paintings all covered with Earth, which when taken off, they appear to have suffered nothing by it. I believe this may be accounted for, by there being no Damp or Moisture in the Place; and that the dry Earth has been rather preservative than hurtful to them. The ancient Beams are yet discernible, but they are become like Charcoal. And I have seen there a Place where anciently they kept Lime for building; a great Quantity of which yet remains as fresh as if made but yesterday. In a Word, perceiving all those who are called Superintendants of this Affair, wholly ignorant of what they are about, I began to suffer in a very sensible Manner; so that every Day appeared a Month, till I should deliver my Letter, and see what Success it would meet with. For had it succeeded, I should have gone immediately, and drawn those Things, which, not being taken care of, though of great Curiosity and Erudition, will soon be destroyed.——However, as I could do nothing more, and having a great Concern for those fine Things in a perishing Condition, I left them a Paper of Directions how to manage. If they do not observe them, the greater Misfortune will be ours, to hear that what Time, Earthquakes, and the Ravages of the Volcano, have spared, are now destroyed by those who pretend to have the Care of them, &c.

*Extract of a
Letter from
Mr George
Knapton, up-
on the same
Subject. Ibid.
p. 489.*

3. I shall not trouble you with any Account of the Curiosities of *Naples*, they being so well known, only of one which is something out of the common Way, the ancient City of *Herculaneum*, which was swallowed up by an Earthquake. It is now under a Town called *Portici*, a Quarter of a Mile from the Sea, at the Foot of *Vesuvius*; and has no other Road to it, but that of the Town-well, which is none of the most agreeable, being in some Parts very streight, in others wide, and cut in a most rude Manner. Toward the Bottom, where you go into the City,

City, it is very broad, which they have made so, to turn the Columns, which were brought up: For I spoke to an old Man, living next Door to the Well, who told me, he was one of those employed in digging there; and that they began 27 Years ago, and worked 5 Years: That the best Part of the Duke *di Belbofi's* present Estate was found there; the most principal Things were, two Columns of Oriental Alabaster, which were sold for 50,000 Ducats: That they had found also many fine Statues, the best of which were sold, and some he had sent to *Lorraine*. I saw 5 which they have put up in the Market-place, all clothed Figures, one in a Consular Habit, the others Women: They are all well drest, and in a fine Taste, but want the Heads. In the Duke's *Villa*, which is near and by the Sea-side, are two others entire, both Women; one seems to be a *Livia*: Also the Fragments of a naked Figure, which wants the Head and Arms, of a good Style. These, with some Ornaments and Fragments of various Sorts of Marbles, are all that is to be seen there, of what has been dug up.

Having given you some Account of what is taken out of this subterraneous City, I shall now proceed to what remains in it, and our Journey down to it. At our coming to the Well, which is in a small Square, surrounded with miserable Houses, filled with miserable ugly old Women, they soon gathered about us, wondering what brought us thither; but when the Men who were with us broke away the paltry Machine with which they used to draw up small Buckets of Water, I thought we should have been stoned by them: Till, perceiving one more furious than the rest, whom we found to be *Padrona* of the Well, by applying a small Bit of Money to her, we made a shift to quiet the Tumult. Our having all the Tackle for descending to seek, gave Time for all the Town to gather round us, which was very troublesome: For, when any one offered to go down, he was prevented either by a Wife, or a Mother; so that we were forced to seek a motherless Bachelor to go first. It being very difficult for the first to get in, the Well being very broad at that Part, so that they were obliged to swing him in, and the People above making such a Noise, that the Man in the Well could not be heard, obliged our Company to draw their Swords, and threaten any who spoke with Death. This caused a Silence, after which our Guide was soon landed safe, who pulled us in by the Legs, as we came down. The Entrance is 82 Feet from the Top of the Well: It is large, and branches out into many Ways, which they have cut. We were forced to mark with Chalk, when we came to any Turning, to prevent losing ourselves. It gives one a perfect Idea of a City destroyed in that Manner: For one there sees great Quantities of Timber, in the Form of Beams and Rasters, some lying one Way, some another; some, as they broke in the Fall, others entire: These are sticking in the Sides of the Ways, and are become a perfect Charcoal; but those in moist Places, and where the Water ouses, you may run your Hand into, and work like a Paste, and they have more the Colour of rotten

Remains of a City, Statues, and Pictures found under Ground.

Wood. The Walls are some tumbled flanting, others crossing them, and many are upright. One sees great Quantities of Marble, as Bits of Window-cases and other Ornaments, sticking out on all Parts. There seem to be, in one Place, the Ruins of some magnificent Building, which they have dug round; for there appear the Bases in white Marble of square and round Columns, which are all of a Size; and, what is surprizing, they have not examined whether they have any Columns on them, which one Stroke of the Pick-ax would have done. I scraped away the Earth at the Side of the Base of a Pilaster, and found the Wall covered with a very beautiful Marble, but could not reach to discover what was on the Top of it. There are but two Columns that appear, one of a red Marble, the other of Brick covered with Stucco, and fluted. In one Place there are about 14 Steps, which resembled the Seats of a Theatre. Some of the Walls have the Plaster remaining, and are painted, the Colours still fresh. *We found many Ways filled up, which they had done to save the Trouble of carrying out the Earth.* I observed that they had not gone near the Bottom of the Ruins, for fear, I suppose, of the Springs; for in some Parts they seem to be as low as the Water in the Well. One sees nothing but pure Earth mixed with these Ruins; whereas the Surface of all that Part of the Country, quite to the Sea, is covered with the Cynders of *Vesuvius*. One sees the Buildings were of Brick covered with Marble; for I found no other Sort of Stone there, but thin Plates of Marble of all Sorts in great Quantity. Neither are there any Bases or Capitals of large Columns; two Feet Diameter is the most. Captain *Emelie* brought away a small Capital of a Pilaster, which is very curious, it being much the same as was used by the *Goths* in *Italy*. This makes me think, that they revived the ancient barbarous Style, used before the Introduction of the *Greek*, for the Capital: This is certainly more ancient than the Time of the *Goths* in *Italy*. It was the only one of the Kind we saw there.

Rome, April 24, 1740.

Extract of a
Letter from
Mr Crispe,
upon the same
Subject. Ibid.
493.

4. At *Portici* I saw some antique Paintings, which have lately been taken out of the Ruins of *Herculaneum*: Two of them, about 12 Feet square, with their painted Frames or Borders round them, are as fresh and perfect as if done yesterday; much more so, I assure you, than some of *Raphael's* in the *Vatican*; and for Excellence, and fine Taste, they are, I think, beyond any Thing I have seen. One of these is called the *Pomona*, because, among other Figures, there is a Woman sitting crowned with Fruits and Blossoms. The other is *Theseus*, having just killed the *Minotaur*, who lies dead at his Feet; a Figure of a Youth is kissing his Right-hand; *Ariadne* and another Figure stand at his Left. The Figures in both these are as big as Life. There is a third, somewhat less, of *Chiron* teaching *Achilles* on the Harp, if possible, still beyond the two former. There are above 50 other Pieces, some

some whole Figures, some Heads, some *Mascheras*, some Landskips, some Architecture.

I was to visit the Ruins under-ground, where I saw several Pieces that were taking down, particularly one 15 Feet wide, and eight high: It consists of the Front of a large Temple, with Buildings of the same Architecture projecting on each Side, in the Nature of the Wings of a House. There are Houses also adjoining to this Temple, with Windows divided into Squares, which Squares are painted of a greyish Colour: I will not pretend to say, this is to represent Glass, because I believe we have no Authority for it in any Author of Antiquity: But I tell you the Fact as it is, and among the *Virtuosi* of your Acquaintance you may find out the Meaning. I must observe to you, that in this Architecture the Perspective is very exact; which one may judge of with a good deal of Certainty in those Wings which project. The Architecture is very rich and noble: The *Clair-Obscur* likewise in the other Pictures is well understood; particularly in the *Pomona*, where there are six Figures, which are very agreeably grouped, and the Eye is immediately pleased and reposed. They have dug up a good many Statues, but not above one or two that are tolerably good. There is, however, a perfect Bust of *Agrippina*, Mother of *Nero*, which was found standing in it's Niche: It is as clean as if just finished, has not the least Damage, and is, in the Judgment of every body, as well as myself, equal to most Things of that Kind in the World: For my own Part, I should not stick to say, it is altogether as fine a Portrait as the *Caracalla* of the *Farnese*. There are two Equestrian Statues in Bronze, broken all to Pieces, but which, by the Parts, one may judge to be as big as the *Marcus Aurelius*: They are soon to be put together. They have found several antique Rings, with *Cameo's* and *Intaglia's* set in them; a Fork, a Silver Spoon, made in the Handle like a modern one; the Bowl is pointed like an Olive-leaf; a Case of Surgeon's Instruments, several Kitchen Utensils, Mouse-traps, Vessels full of Rice, a triumphal Car of Bronze, &c.

XVII. It may not be improper to observe, that these *Barrows*, or conical Hillocks, are generally situated on Places of Eminence, on or near the Summit of Downs, and so capable of being seen at a great Distance; and likewise very often near the most publick or greatest Roads, though sometimes in inclosed or fenced Lands, but not often: They lie sometimes 2, 3, even 7, in a strait Line, now and then only one or two by themselves: Sometimes also the single ones seem to regard, in respect of their Position, a greater Number, as is observable in N^o iv. where the Urn was found, and N^o v. on the same Down. An Attempt to examine the Barrows in Cornwall, by Stephen Williams, M. D. F. R. S. Ibid. P. 465. Fig. 24.

The Height and Dimensions of the *Barrows* in *Cornwall* are various, from 4 to 30 Feet high, and from 15 to 130 broad; but they always bear a regular Proportion in their Form. Some have a *Fossa* or Ditch round their Circumferences, others none; some a small Circle of Stones at

at the Top, others none; some a Circle of Stones round the extreme Verge of their Basis.

The *Barrows*, which are the Subject of our present Inquiry, lie on the Summit of *St Austle Downs*, about a Mile from the Town, and half a Mile from the Sea; where a fine Bay is formed by Nature, well defended from most Winds, with good Anchorage, and deep Water. Mr *Mitchel*, Lieutenant in the Navy, has lately taken a curious Survey of it, by Order of the Admiralty, and for the Benefit of the *English Fleet*.

Fig. 24.

Barrow, No. 1.

We opened *Barrow*, N^o 1. a small one, with no Ditch round it, but a small Circle of Stones on the Top, of the Height of 4 Feet, of the Breadth, at the Basis, of 15: When we had taken off the Surface, the Body of the *Barrow* seemed to be composed of foreign or adventitious Earth, which being cut through near the Centre, we found a circular Pit of a Foot deep, and of the same Diameter, dug out of the natural Soil of the Country, and two flat Stones in it. By adventitious or foreign Earth, is meant such as does not rise on the Place, but is fetched from some Distance; so the Earth of this and the other *Barrows*, of a yellow Colour, is known to be the natural Soil of a Hill a Mile distant from them.

Barrow,
No. II.

The perpendicular Height is about 8 Feet Diameter, at the Base about 30 Feet, with a *Fossa* or Ditch round it: The Surface being removed, the Body of the *Barrow* consisted of the adventitious Earth, of a yellow Colour, and now and then some small Stones interspersed, not regularly; at the middle we found a Pit of a cylindrical Shape, 2 Feet broad, and $1\frac{1}{2}$ Foot deep, out of the natural Soil: Over the Pit we observed 3 Stones placed Edgeways, to cover the same, though nothing in it but some Earth of the *Barrow*, and 3 small Stones.

Barrow,
No. III.

Fig. 25.

The perpendicular Height of the *Barrow* was $10\frac{1}{2}$ Feet, Diameter, at the Base 46, with a Ditch round it: Upon removing the Heath or Grass, (which was the common Surface to all the *Barrows*) we observed the same yellow adventitious Earth, which being penetrated a Foot through, we found a small Circle of Stones at *B*, which surrounded the *Barrow*; then being passed through the same yellow Earth, we came to *C*, within 10 Feet of the Centre of the *Barrow*, where we found a *Stratum* or Lay of flat Stones, carefully laid flatways, to cover the rest underneath, as in the Roof of an Oven; which being taken off by the 6 Tinnors, (whom an ingenious Gentleman of *St Austle*, and myself, employed on Purpose) a large Bed or Heap of Stones, irregularly and confusedly mixed together, and of various Sorts, appeared, and under them a large Number of Stones artfully placed and contrived, so as to form the Shape of a Cone, their Points uppermost, and their largest Parts downward. Under this Heap we saw a Circle of 2 Feet Diameter, equal in Height with the natural Surface of the Country, and causewayed with small Stones laid Edgeways, their sharpest Point downward; which Stones being taken up, we observed a cylindrical Pit at *D*, two Feet broad,

broad, and $2\frac{1}{2}$ Feet deep, cut out of the natural Soil, as the former; the Sides of the Pit were carefully lined round with these flat Stones, though none at the Bottom. We met with, first, some small Stones of various Shapes and Sizes, lying irregularly; under them appeared a black greasy Matter, but not above an Inch thick; some of the adventitious Earth had crept through the Crevices of the caufewayed Stones into the Pit. It deserves our serious Observation, that the Stones (which composed the Heap lying over the cylindrical Pit) were brought from Places both high and low situated, and many Miles distant from one another, as the *Par*, *Polmeor-Clif*, *Hainsbarrow*, *Pentuan*, and *Carn-clays*, a high Hill, the Distance between some of these being four or five Miles.

Though we had hitherto found no Urn, yet being persuaded by the unctuous black Earth, and the cylindrical Pits, in the Centre of every one of the *Barrows*, the artful Position of the Stones to cover and guard them, and the foreign Earth, that these *Barrows* were erected for Sepulchres; we resolved to proceed farther, and pitched upon N^o iv. as one somewhat different from the rest, both as it's Situation seemed to regard a greater Number of *Barrows*, and as it's Circumference appeared to have a very large Circle of Stones round it, without any Ditch or *Fossa*.

Barrow,
No. iv.

We began our Passage at *A*, through a Circle of Stones of five Feet broad, and two high; then we passed through adventitious Earth *B*, when we came to a second Circle at *C*, of Stones of 3 Feet high, and 3 Feet broad; after them appeared nothing but foreign Earth, till we found, at the Centre *E* of the *Barrow*, an oblong square Pit, of the Depth of $1\frac{1}{2}$ Foot, and Breadth 2 Feet, and Length 5 Feet; in the Bottom appeared a black greasy Matter or Substance, as in the last *Barrow*, about an Inch thick; the Pit was not covered or defended by any Stones. However, being not satisfied, we examined the uttermost Circle of Stones, and on the Inside of it we struck on a great flat Stone, about 5 Feet broad, and one Foot thick, under which, when lifted up, we found two other thin flat Stones, and under them a smaller flat Stone, which covered an Urn, which also stood upon another flat Stone in a small Pit, deeper than the Circle of Stones, and carefully wedged in, as well as supported, with many small Stones round it: This Urn is made of burnt or calcined Earth, very hard, and very black in the Inside; it has 4 little Ears or Handles; it's Sides are not half an Inch thick; in it were 7 Quarts of burnt Bones and Ashes; we could easily distinguish the Bones, but so altered by the Fire as not to be known what Part of the Skeleton they composed: The Urn will hold 2 Gallons, and more; it's Height is $13\frac{1}{2}$ Inches, Diameter at the Mouth 8, at the Middle 11, and at the Bottom 6.

Fig. 27.

Before we proceed any farther, a natural Observation will occur, in what Manner the Ancients (that used Cremation, and all Nations of that Way of Burial) expressed their Regard for the Deceased; and this plainly

plainly appears from the Structure of the *Barrows* or *Tumuli*, particularly N^o 111 which is not only composed of foreign Earth, but of Stones brought from so many and so different Places; for, in erecting these *Tumuli*, the greater the Charge or Trouble, the greater must be the Respect due to their Princes or Generals. Thus each Soldier or Friend might bring some of the Earth or Stones from distant Places, where they lived, or were stationed, to compose the *Tumulus*, which generally was in Proportion to the Greatness, Rank, or Power of the Deceased. Many Passages might be repeated from Authors of different Nations; but a few will not be tedious: Thus *Horace*, [*Lib. I. Ode 28. Carm.*]

*Quamquam festinas, non est mora longa; licebit
Injeto ter pulvere curras.*

Thus, again, we find *Achilles*, in *Homer*, complaining, how small a *Tumulus* he had made for his beloved *Patroclus*, [*Iliad. Ψ. v. 245.*]

Τύμβον δ' ἔμαλα πολλὸν ἐγὼ πονέεσθαι ἄνωγα,
'Αλλ' ἐπεικέα τοῖον, ἔσσι.

That, these *Tumuli* were erected by pouring on Earth, or heaping up Stones, is plain from the Words so frequent in *Homer*, [*Homer, Iliad. Ψ. v. 257.*] χεῖν, χεύαντες τόδε σῆμα; and χερσὶν ἐχωννύμεθα, in the *Anthol. Epigr.* Again, that they were composed of Stones, appears from the Words, λαίνας τ' ἐξοκώμασι in *Euripides*, and sometimes polished, ξεοὶ πάφοι, τύμβῳ ξεῶς, from the same Author. Parallel to this, Mr *Roswell*'s Observation appears, who found a curious Urn in a *Carnedd*, or Heap of Stones, in *Anglesey* [*Mona Rest. pag. 49.*] So the *Britains* had the same Custom of throwing Stones on the Deceased: Hence comes the *Welsh* Proverb, *Karn ar dy Ben*, Ill betide Thee.

So, again, Pillars of Stones were erected as sepulchral Monuments, near the Ways, or in Memory of some Battle or Victory; as well as for Places of Religion and Sacrifices. I need not quote the Eastern Authors so well known; only observe, that they are frequent in *Cornwall* and *Wales*, were called *Meini Gwyr*, a Stone for Play, perhaps in Memory of Funeral Games, and sometimes *Llech*, i. e. *Tabula Saxeæ*: The following is a remarkable one.

A Stone Pillar.
Fig. 24.
No. vi.

This large Stone is called by the Natives *Long Stone*, and stands upright on the Summit of the Downs, between the Highways after they are divided: The End fixed in the Earth has been examined above 8 Foot deep, but not discovered how much lower it lies; above the Surface of the Earth the Stone measures 13 Feet in Height, 3 Feet in Breadth, and 2 1/2 Feet in Thickness.

An Encampment.
Fig. 24.
No. xiii.

An Encampment, about a Mile and half distant, shews itself: It lies near the Cliffs, and overlooks *Par*, or *St Austle Bay*, by it's high Situation: The Form is a true Circle, about 100 Yards Diameter; the

Agger,

Agger, or Rampart, is very low; the Ditch is about 2 Yards deep, and 5 broad, imperfect towards the Sea, where the Ground has a great Declivity; and the Ascent to the *Agger* more difficult: It is called *Castle Gotba*. However, to prevent the Influence which a false Interpretation might produce, we must observe, that *Gotbys*, both in *Welsh* and *Cornish*, signifies High, or Proud; so that from *Kastelb*, or *Castellyn Gotbys*, easily flows *Castle Gotba*, in the modern Dialect, as it's Situation declares. Fig. 28.

I have annexed a Map of *Par-Bay*, (as copied from Mr *Mitchel*, by a good Hand of our Dock) and of the Country, with the *Barrows*, Stone Pillar, &c. that this Essay may be rendered more intelligible. I have also been more nice in examining the internal Structure of these *Barrows*, as will appear by the Section and Ichnography of them. Because the best Authors have been contented with an external View of these *Tumuli*, but never penetrated the inmost Recesses, nor have we left any certain Characteristick to distinguish one Nation from another, I wish my Endeavours may give any new Light into this Affair. Fig. 24.

It will be tedious and needless to enumerate what Nations burnt their Dead, and erected *Tumuli* over them; we must only remember, that it was the Custom among most Eastern Nations, and continued with them, after their Descendants had peopled the most Western and Northern Parts of *Europe*: Hence it is easily traced in *Greece*, *Latium*, *Iberia*, *Gallia*, and *Britannia*, as well as *Germany*, *Sweden*, *Norway*, *Denmark*, till *Christianity* appeared, and abolished it.

Let us next consider what Nation or People inhabited, or were acquainted with, the most Western Part of *Britain*.

That the *Celtæ* and *Britons* inhabited here, need not be proved; though, perhaps, I may hereafter trace their Relicks or Remains of *Druidism* in *Carneds*, *Cromleches*, *Meini Gwys*, Fortifications, and the like. *Celtæ.*

That the *Phœnicians* first, and after them the *Grecians*, knew these Islands, and traded here for Tin, long before the *Romans* Knowledge of them, is plain, and easily proved by *Grecian* and *Roman* Authors, as *Strabo*, *Polybius*, *Pliny*, &c. *Polybius* wrote a Book, *Περὶ τῶν Ἰσθμίων Νήων, καὶ τῆς Κασιτέρης Καλαχευῆς*. Which Book, though now lost, yet *Strabo* witnesseth, that therein he refuted the Errors of *Dicaearchus*, *Pythias*, and *Eratoſthenes*, concerning the Magnitude of *Britain*, Authors much older than himself. And though Disputes may arise, whether the *Bratanac* of the *Phœnicians* gave Name to these Islands, yet it is certain, that the *Greeks* knew them under the Title of *Cassiterides*, the Tin-Islands. *Phœnicians and Grecians.*

But whether these Nations were ever settled here as Inhabitants, and became Bodies Politick, to erect Fortifications, Towns, Cities, Encampments, and the like, is without any Certainty. Indeed a learned, and no less laborious Author, [*Sammes's Britan.*] has endeavoured to derive the Names of Places, Customs, Religion, Art of War, Lan-

guage, and Government, of the ancient Britons from the Phœnicians being settled here; and this only upon a supposed Affinity between some British and Phœnician Words, and their Trade for Tin: But by the same Way of Reasoning, we might as well and easily prove, that the Phœnicians received these very Words from the Descendants of Gomer, the Celtæ, before they passed over the Hellepont; and also that the British or Celtic Words, which occur in the Grecian and Roman Languages, are derived and owe their Origin to the same People as they journeyed Westwards, and sent Colonies to different Parts to inhabit them, particularly the most South; the Northern Parts being peopled by the Descendants of Askenex, Gomer's Son: Hence the Teutonic Language flows, though not without some Affinity to the Celtic in few Words.

Romans.

That the Romans conquered great Part of Britain, is not disputed; but whether they possessed the most Western Part, now Cornwall, many Learned doubt. Let us enumerate the chief Arguments and Proofs for it: The Geography and Figure of Britain is delivered in various Grecian and Roman Authors, and the most Western Part is not forgot. *Cæsar*, the first Roman Invader, mentions the triangular Form of the Island, [*Comment. Lib. v.*] *Insula est triquetra; unum latus est contra Galliam, alterum vergit ad Hispaniam & solem occidentem, qua ex parte est Hibernia; tertium est contra septentrionem.* But, out of a great many, let us hear *Ptolemy*, Geograph. Lib. II.

Νῆσος Βρετανικῆς θέσις.—Δυσμικῆς πλευρᾶς περιγραφῇ, ἢ παρὰκειται, ὅτι Ἰν-
 ἑρπυῖος ὠκεανός, καὶ ὁ Οὐερρινίος.—Ἡρακλέους ἄκρον, Ἀντιβέσσιου ἄκρον, τὸ καὶ Βολί-
 ριον· Δαμνόνιον, τὸ καὶ Ὀκρινου ἄκρον· τῆς ἐφεξῆς μεσημερινῆς πλευρᾶς περιγραφῇ,
 ἢ ὑπόκειται Βρετανικὸς ὠκεανός, μετὰ τὸ Ὀκρινου ἄκρον· Κενίωνος πόλιν ἐκβολαί,
 Ταμάρεν πόλιν ἐκβολαί, Ἰσάκα πόλιν ἐκβολαί. And again: Μετ' οὗ [Δυρο-
 τριδας,] δυσμικῶταί τε Δαμνόνιοι, ἐν οἷς πόλεις Οὐολίβα, Οὐξέλα, Ταμάρε, Ἰσκα.
 Λεγεὼν δ' ἐνέρεα Σεβαστή.

Which may be thus translated: “After the Position of the British
 “ Island, let us survey the Western Side, which lies along the Irish and
 “ Vergivian Seas, where lie the Promontory of Hercules, the Promon-
 “ tory Antivestium, sometimes Bolerium, the Promontory Damnonium,
 “ called also Ocrinum; and in the Side towards the South, and bounded
 “ by the British Ocean, after the Promontory Ocrinum, the Rivers Ce-
 “ nion, Tamar, and Isaca, discover themselves, by discharging them-
 “ selves into the Sea.” The Coast and Rivers being mentioned, next
 described are the Cities. “The most Westward after the Durotriges,
 “ are the Damnonii, among whom are these Cities (πόλεις); Voliba,
 “ Uxela, Tamare, and Isca, with the Legio Secunda Augusta.” *Ptole-*
my of Alexandria, under the Reigns of Trajan, Hadrian, and Antoninus
Pius, wrote his Geography. In the *Iter Britan. Antonini*, Itiner. XII.
 & xy. supposed to be composed or begun in the Times of Antoninus
Pius or *Caracalla*, Mention is made of *Dumovaria*, *Moriduno*, * *Sca-*

* Which is only a false reading for Isca Dumuniorum. C. M.

dum Nunniorum, Leucaro, Bomio, and Nido, Iter xii. and in Iter xv. of Dumovaria, Moriduno, Isca Dumnoniorum. That by these last-mentioned Names are meant *Dorchester, Seaton, and Exeter*, is generally allowed; though whether *Leucaro, Bomio, and Nido*, are to be traced in *Damnonium*, may admit of a future Inquiry. The *Notitia Romana*, supposed to be written at the End of *Theodosius* the younger, is indeed silent in respect to the most Western Part of *Britain*, then called *Flavia Caesariensis Britannia*, but seems principally to regard the Eastern and Northern Coast, the *Littus Saxonicum*; the Roman Soldiers being then withdrawn to these Parts, to defend the Island against the Invasions of the Saxons, and Inroads of the *Picts*.

In the *Chorographia Britanniae Ravennatis*, supposed to be compiled by *Gallio*, the last Roman here with any Command or Forces, we have this Preface: *In Britannia plurimas fuisse legimus Civitates & Castra, ex quibus aliquantas designare volumus, Tamaris, Uxelis, Scadam Namorum, juxta quam civitatem est Moriduno*: Allowed by all Commentators to be *Tamerton, Lestwithiel, Exeter, and Seaton*. Again: *Currunt autem per ipsam Britanniam Flumina plurima, ex quibus aliquanta nominare volumus, i.e. Tamaris, Tamer, Isca Ex, Tamion Tavy, Leuca Low, Dorvatum Dart, Antrum Arm, Vividin Foy or Foalb of the Britons*. Most Interpreters allow the *English* Names agreeably translated to the *Latin*.

In the *Tabula Theodosiana* or *Peutingeri*, supposed to be made about the Time of *Theodosius the Great*, occur two Stations, *Isca Dumnoniorum, Riduno*, which exactly answers to *Isca Dumnoniorum* and *Moriduno* of *Antoninus*.

More might be extracted, to prove that the Geography of *Dumnonium*, or *Danmonium*, was well known to the Romans. But let us now consider, that since the *Isca Dumnoniorum* is said by *Ptolemy* to have the *Legio Secunda Augusta* stationed at it, and so great and exact Account is given of the *Civitates* (πόλεις) & *Flumina*, in the same Author, as well as *Antoninus, Chorographia Ravennatis, and Tabula Peutingeri*, can we suppose, that the Romans could be ignorant of the Tin, the Product of *Danmonium*, so often mentioned in the *Grecian* Authors? And since that their own Name of *Dunmonium** was by themselves changed from the *British*, *Dun Mwyn*, a Hill, or Country of Metals; agreeable to which Etymology we have at this Day a Place abounding in Metals, called *Mwyn*, as *St Mwyn* Parish, within two Miles of the above-described Barrows. Besides, it must be contrary to Reason, and the Roman Genius, [*Vita Agric. Sect. 12.*] (*Nobis nec deest Avaritia*, says *Tacitus*, their own Countryman) to imagine, that the Romans, called *Raptores Orbis*, (by the same Author) should neglect to hunt after the Metals of Tin and Lead, which were valued as the Rewards of Victory. *Tacitus* has a beautiful Passage to this Purpose, [*ib. Sect. 12.*] *Fert Britannia Aurum & Argentum, & alia Metalla, pretium Victoriae*. Again:

* Rather *Dunmunium*, q. s. *Dunmwynium* C. M.

I hope it will not be tedious to make some Extracts out of *Galgacus's* Speech to his Army, going to encounter the Roman Eagle, and when the Roman Fleet had surrounded and created Terror to *Caledonia*: *Nulle ultra Terræ, ac ne mare quidem securum imminente classe Romana.*—*Nunc terminus patet: Romani,—Raptores Orbis,—avarī,—& ambitiosi, quos non Oriens, non Occidens satiaverit,—bona fortunæque in tributa egerunt; in annonam frumenta, corpora nostra ac manus sylvis & paludibus emuniendis verbera inter & contumelias conterunt;—neque sunt nobis Arva, aut Metalla, aut Portus, quibus exercendis reservemur:—hic Dux, & exercitus ibi, tributa, & metalla, & cæteræ servientium pænæ.*—Perhaps the Curious have not sufficiently remarked this beautiful Speech of *Galgacus*, where he so pathetically lays before them the Loss of their Support, the Metals, for which the Romans so eagerly fought, and hazarded their Lives, as the expected Reward. He likewise relates the Fear created by the Appearance of the Roman Fleet on their Coasts. If we reflect again, that the Roman Fleet not only sailed round *Caledonia*, but also the *Dunmonium*, when the Roman Ships went to attack the *Silures* in *Wales*; and that the Name *Dun Mwyn*, must declare the Product of the Country, as Authors did likewise; and that the second Legion was stationed at *Exeter* the capital City; could the Romans in an unusual Manner sit idle, and forget their darling Metals, and not penetrate the most secret Places?

It will be a Digression, but I hope not an impertinent one, to confute a vulgar Error, that the Roman Soldiers made the Highways in Britain; when it is plain, that the poor conquered Britons under them, as Masters and Overseers, & *inter verbera & contumelias*, causewayed the Bogs, and pared Woods; *Paludibus & Sylvis emuniendis*, are *Tacitus's* Words: This was the unhappy State of our conquered Ancestors the Britons.

Much more might be said from the Metals: Let us take a Remark from the Language, and this is one of the learned Mr *Edward Llwyd's*, who says, [*Archæol. Brit. p. 32.*] that the *Dunmonian* and other Southern Britons, being, on account of their Situation, earlier conquered by, and consequently more conversant with the Romans, than we of *Wales*, it is not to be wondered, if several Latin Words occur in the Cornish Dialect not owned by the Welsh, as Cornish Splendor, Latin Splendor, Welsh *Eggyrder*, Cornish *Glitis*, Latin *Glacies*, Welsh *Jâ*, Cornish *Bovin*, Latin *Bovina*, Welsh *Kigeidon*, &c.

If we trace the Romans by their Remains, as Castles, Camps, Coins, Amphitheatres, we may probably be very lucky. Thus we observe three circular Camps or Fortifications within a Mile and half of *Gram-pound*, the *Voluba*, which lies in the Centre of them. They have a single *Agger*, and a Ditch: In the Rampart of one of them was found an Urn some Years since, but broken by the Workmen: Another Castle *Dennis*, where there is a triple Rampart and Ditches, which has a Causeway leading to it peculiar to the Romans; and I am informed of

an Amphitheatre at *Torran* in *Zabulo*: But I shall not dwell longer, at present, on this Subject, but mention a very weighty Argument from Coins found in the most Western Part of *Dunmonium*. The first were found in *Manacon* Parish near *Helford* River, and not many Miles from the *Ocrinum Dunmoniorum*, *Lizard-Point*. I have had the Sight but of three, which are Copper, and of a small Size, very fair and legible: I had them from a Friend at *Falmouth*.

1. *Constantinus jun. Nob.* Reverse *Corona Civica*.
2. *Constantius* — — — *Provident. Caes.*
3. *Constantius Nob.* — — *Gloria Exercitus.*

On the other Side of *Helford* River, in the Parish of *Constantine*, last Year, a labouring Man at Plough turned up about 40 or more: I have seen about 30 of them, 6 of which are Silver, and the others Copper. The Silver ones are very fair and beautiful, and about the Bigness of a Farthing, or the *Roman Denarius*, and are these:

- | Silver. | Reverse. |
|--|-------------------------|
| 1. <i>Imp. Caesar Vesp. Aug.</i> — — | <i>Pontif. Maxim.</i> |
| 2. <i>Hadrianus Aug.</i> — — — | <i>Cof. III.</i> |
| 3. <i>Divus Antoninus</i> — — — | <i>Divo Pio.</i> |
| 4. <i>Imp. Caf. Nerva Trajan. Aug.</i> { | <i>P. M. TR. P.</i> |
| | <i>Cof. III. P. P.</i> |
| 5. <i>Diva Faustina.</i> — — — { | <i>...ugus... other</i> |
| | <i>Letters defaced.</i> |
| 6. <i>Imp. M. Jul. Philippus Aug.</i> — | <i>Annona Aug.</i> |

Copper.

Six in Number, the Size larger than a Halfpenny, and near the Weight of the *Roman As* of half an Ounce, scarce legible.

1. *Imp. Caesar Domit. Aug.* } . . *Augusti.*
Germ. Cof. XIII.
2. *Antoninus Aug.* — — — — —
3. *Nerva Trajan. Aug.* — — — — —

The Reverse not legible, except one Word *Augusti*. Three more of the same Size, entirely defaced.

Copper Coins.

Five in Number, about the Bigness of a Farthing.

1. *Constantius Jun. Nob.* Reverse *Fel. Temp.*
2. *Constantius.* — — — — —
3. Seems to be a Head }  the *Labarum*, I take,
of *Constantine.* } of *Constantine.*

The other two defaced.

Twelve in Number, less in Size than a Farthing, or *Triens* or *Quadrans* of the *Roman As*, of which.

- 4 *Constantinus.* — — — — *Gloria Exercitus.*
- 2 *Constan-*

2. *Constantinus Aug.* — — — — — *Votis x.*
 3. *Constantinus.* — — — — — *Roma.*
 4. *Constantinus Jun. Nob.* — — — — — *Providentia Cas.*
 5. — — — — — *Aug.* — — — — — *Oriens Aug.*

Three others not intelligible.

These Coins are in the Custody of Dr. Ruffel of Truro. If I had Leisure, perhaps I might have been nice in discovering the Faces and Reverse: This Gentleman informs me, that near the Place where the Coins were found, is a circular Camp near Helford Harbour.

Danes.

I could have longer dwelt on this Subject, but have been tedious already: However, must not forget the Danes, who certainly landed here in Cornwall, but by Invitation from the Britons, to assist them to overcome the Saxons, and probably never had any Settlement here: They, as Friends, did not want Fortifications for their Defence in Cornwall, since they went as far as Exeter with the Britons against the Saxons, who could never penetrate Cornwall till the ninth Century, when, by one fatal Battle, the Britons were obliged to become Tributaries. This Battle was fought near Lanelford. Several Places, I am satisfied, supposed to be Danish by the Names, never did belong to them. Thus, to instance in one, Carlle Dennis, which is certainly a British and Cornish Name; *Kastell Ennys*, or *Castellyn Enny*, signifies a Castle on an Island, or in the Form of one either moated or trenched round, and here are three Trenches. Again; *Pendennis* might, for the same Reasons, be reckoned Danish, when *Pedn*, or *Pen Ennys*, in Cornish, signifies the Head of an Island, or a Peninsula.

References to
Fig. 24.

N^o I, II, III, IV. The Barrows on the Down, which were opened: In the last was found the Urn. v. A Barrow, whose Position respects a larger Number, as N^o IV. does the others lying Eastward of it. vi. Long Stone. vii. St Aufse. viii. The Road to Grampound, after it's Division near the Barrows, ix. and near Grampound it meets the other Branch (viii.) again. N. B. There is not any other convenient Road between Uxella, Leftwithiol and Voluba, Grampound. x. Road to Uxella, or Leftwithiol. xi. Road to Foy, or Vividin. xii. A Brook of Water. xiii. Castle Gotha. xiv. Hills.

Fig. 25.

Fig. 25. The Section and Ichnography of Barrow, N^o III. A. The Circumference of the Barrow. B. A small Circle of Stones. C. The Body of Stones, which lay over the cylindrical Pit. D. The cylindrical Pit. E. The Earth of the Barrow. F. The Passage cut by the Workmen. The Diameter of the Barrow was 46 Feet. The perpendicular Height 10 $\frac{1}{2}$ Feet.

Fig. 26.

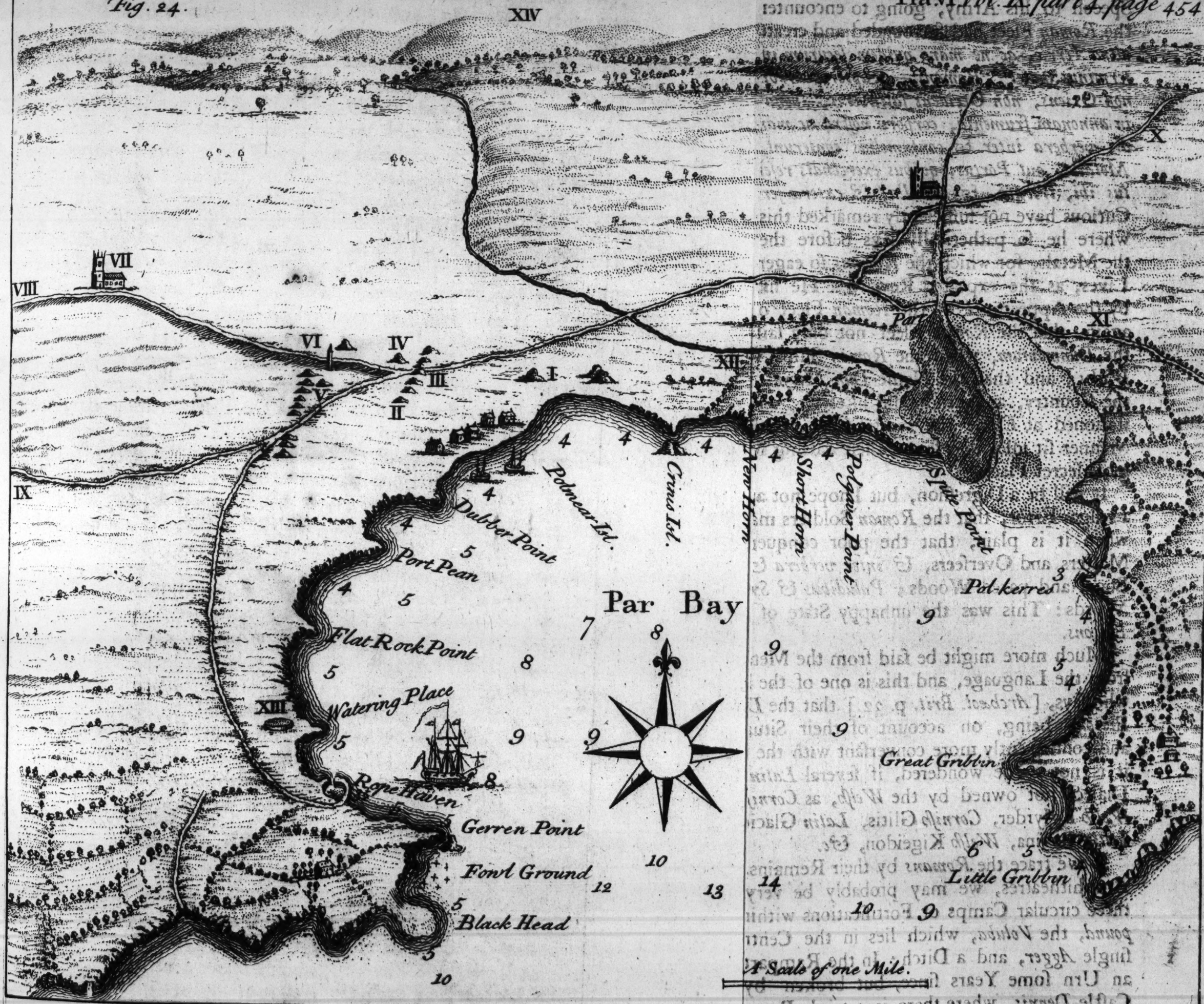
Fig. 26. The Section and Ichnography of Barrow, N^o IV. A. The first Circle of Stones. B. Earth. C. The second Circle of Stones. D. Earth. E. The Centre. F. The oblong Pit. G. The Passage cut by the Workmen. H. The Place where the Urn was found.

Fig. 27.

Fig. 27. The Urn. It's Height was 13 $\frac{1}{2}$ Inches. Diameter at the Mouth 8 Inches, at the Middle 11, at the Bottom 6 $\frac{1}{2}$.

Fig. 28.

Fig. 24.



rp[®]

Fig. 28. The Plan of Castle Gotha. A. The Diameter of the Camp, 100 Yards. B. The Rampart [Agger.] C. The Ditch, 5 Yards deep, and 2 Yards broad, which reaches no farther than D D, where there is a falling away of the Ground towards the Sea.

XVIII. Mr Chanter having set some Labourers to dig a Cellar in an Outhouse (belonging to his Mansion) fronting the West End of the Minster, and adjoining to the Checquer-Gate; they found 2 or 3 Stone Coffins, which had probably lain there ever since the Demolition of the ancient Parish-Church of St Mary Magdalen, to make Way for the Foundation of the Cathedral, and it's Appendages: But going lower, about 10 or 11 Feet deep, they found some Building; and at 13 Feet, to their no little Surprise, they struck into the Corner of a Vault. Mr Symphon took it to be a Roman Hypocaustum: He had the Dimensions of it taken, as in the Plan; see Fig. 29, and the Profile, Fig. 30.

A. The *Præfurnium*, [Stoking-place] Entrance or Place, where the *Fornacator* [the Stoker] stood to manage the Fire. It is 3 Feet 6 Inches square, it's Height not certainly known, because of the Rubbish which lay at the Bottom.

B. The *Fornax*, Furnace, or Fire-place, built of Brick, and arched over with the same. It's Length from E to G 5 Feet 6 Inches; it's Height 3 Feet at E, but 4 Feet at F, rising gradually; 3 Feet 6 Inches long from E to F, and 2 Feet wide between E and F; 2 Feet long from F to G, and but 19 Inches wide between F and G.

C. The *Alveus* [or Body of the Kiln], 21 Feet 4 Inches long; 8 Feet 4 Inches broad; and 2 Feet 4 Inches high. The Floor is made of a strong Cement composed of Lime, Sand, Brick-dust, &c. which the Masons of that Country call *Terrace-Mortar*. Upon this Floor stand 4 Rows of low Pillars, made of Brick, 11 in a Row; the outside Rows round, the 2 inner Rows square: The round ones are about 11 Inches Diameter, the others 8 Inches square: Each standing on a Brick 11 Inches square, as at Fig. 32, and 2 Inches thick; the Shaft 2 Feet high, upon which lies another Brick likewise 2 Inches thick, some 17, 18, and others 19 Inches square, as at Fig. 31, which represents the Profile of 2 square Pillars with the square Bricks at Top and Bottom, which make the whole Height of the *Alveus* 2 Feet 4 Inches. The Pillars, both round and square, are jointed with Mortar, and that very clumsily: The round Pillars being composed of 10 Courses of semicircular Bricks, as at Fig. 32, A, laid by Pairs; the Joint of every Course crossing that of the former at right Angles, as at Fig. 32, C; with so much Mortar betwixt, that the 2 Semicircles rather form an Oval, and so the Pillars look at first Sight as if they were wreathed: The square Pillars are composed of 13 Courses of Bricks, as at Fig. 32, B, 8 Inches square, as at Fig. 32, D; these Bricks being thinner than those which compose the round Pillars.

On the Top of these Pillars rests the *Testudo* or Floor of the *Sudatorium* or Sweating-Room, Fig. 30, H I, which is composed thus: First, there

Concerning the Remains of a Roman Hypocaustum, or Sweating-Room, discovered underground at Lincoln, Anno 1739, by Mr T. Symphon. No. 461. p. 855. Aug. &c. 1740. Fig. 29, 30.

Fig. 32.

Fig. 31.

The Remains of a Roman Hypocaustum, or Sweating-Room.

there is a Floor of large Bricks, 23 Inches long, and 21 broad, which lie over the square Bricks on the Tops of the Pillars, as at *Fig. 31*, the four Corners of each Brick reaching to the Centres of four adjoining Pillars, as at *Fig. 33*, where only one of these larger Bricks is represented, as it bears upon four of the smaller Bricks with their Pillars under them. On this Course of Bricks is a Covering of Cement 6 Inches thick, and upon that is set a tessellated Pavement: The *Tessellæ* of the Corner uncovered, *K*, in *Fig. 29*, 30, are of a whitish Colour.

L and *M*, in *Fig. 29*, 30, are 2 *Tubuli* or Flues, 12 Inches wide, and 14 deep, for carrying off the Smoke: The Bottoms of them are even with the Bottom of the *Alveus*, and they are carried upon the Level about 15 Feet, under another Room by the Side of the *Hypocaustum*, and then it is presumed they turn upwards. The Walls of this Room were plastered, and the Plaster painted red, blue, and other Colours, and it's Floor tessellated white; no Figures discernible in either Painting or Pavement. This Pavement, which is on a Level with the *Testudo* of the *Hypocaustum*, is about 13 Feet below the present Surface of the Ground: So deep is old *Lindum* buried in it's Ruins! The Workmen, in digging up this Pavement, struck into the Flue *M*, 3 Feet from the North-East Corner of the *Hypocaustum*; and opened it to the very Corner *K*, which shewed one of the round Pillars, and so the whole was discovered. In sinking the Hole *NK*, at 5 or 6 Feet Depth, they came to the Wall, which was dug up by Pieces with the Rubbish, before they came to the Pavement. This had been the Wall of a Room under which the *Tubuli* ran by the Side of, and not over the *Alveus*, but on the East Side of it.

Mr *Sympton* got a Youth to creep in at the Opening made at *K*, and take the Dimensions of the several Parts, who, the *Alveus* being quite black with Smoke, returned like a Chimney-sweeper, but could not take the exact Measures of the *Fornax* and *Præfurnium*, on account of Rubbish he found in them: Wherefore, Mr *Sympton*, being desirous to inform himself thoroughly of all the Parts of this curious Piece of Antiquity, with the Leave, and at the Expence, of the Proprietor, caused another Hole to be sunk 16 Feet deep, and by driving a Level *OP*, see *Fig. 29*, 30, he broke into the Middle of the *Fornax*; and, having cleared it of Rubbish, found it's Dimensions as above, and that the Bottom of the narrowest Part between *F* and *G*, was raised 18 Inches higher than the Bottom of the Part between *E* and *F*.

The *Præfurnium* was covered over at Top with a large flat Stone.

The *Fornax*, and the two square Pillars in the *Alveus* fronting the Opening of the *Fornax*, were greatly impaired by the Fire, which must have been very violent: Some small Fragments of Wood-coal were thrown out among the Rubbish in the Bottom of the *Fornax*; whence probably it was heated with Wood.

At the Conclusion of the Account Mr *Sympton* sent to Mr *Willis*, he gives us the following Remark upon a Passage in the second Letter from

The Remains of a Roman Hypocaustum, or Sweating-Room.

there is a Floor of large Bricks, 23 Inches long, and 21 broad, which lie over the square Bricks on the Tops of the Pillars, as at *Fig. 31*, the four Corners of each Brick reaching to the Centres of four adjoining Pillars, as at *Fig. 33*, where only one of these larger Bricks is represented, as it bears upon four of the smaller Bricks with their Pillars under them. On this Course of Bricks is a Covering of Cement 6 Inches thick, and upon that is set a tessellated Pavement: The *Tesselle* of the Corner uncovered, *K*, in *Fig. 29, 30*, are of a whitish Colour.

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from Mr Baxter to Dr Harwood, concerning the *Hypocausta* of the *Ancients*, printed in these *Transactions*, N^o 306 *.

“ Mr Baxter says, the *Hypocaustis* was called *Alveus* and *Fornax* : But, “ with due Deference to that learned Gentleman, (says Mr Sympson) I “ humbly apprehend them to have been distinct Parts of the whole, “ which was called *Hypocaustis* : The Ground of my Conjecture is this : “ In the first Place, it would hardly be possible to make a Fire in that “ Part of this *Hypocaust*, which I call the *Alveus* ; much less to come “ at it, to manage it, being so low, and so crowded with Pillars, as to “ admit only a slender Person to crawl amongst them, and that not “ without Difficulty. In the next Place, the Floor does not seem de- “ signed for it, nor are there any Appearances of Ashes on it : And, “ further, that the *Fornax* was, where I have placed it in this, appears “ not only from the Structure of that Part, but from the Bricks being “ much burnt [and Pieces of Wood-coal being found in it] ; whereas “ in the *Alveus*, the Bricks are only black with the Steam and Smoak “ being drawn through it by the *Tubuli*. But I submit my Opinion to “ your better Judgment.” He might have added, that only those Pil- lars in the *Alveus*, which faced the Mouth of the *Fornax*, had suffered much by the Fire, the others not.

That *Hypocaust*, described in N^o 306 above-mentioned, must have been a much hotter Room than this ; for, instead of the Flues being carried under another Room, the Walls of the Sweating-room itself were hollow or double, and a great Number of Flues carried up between them all round the Room. A curious Model of this is still to be seen in the *Museum* of the *Royal Society*.

This *Hypocaust* may serve as a Model for Malt-kilns, or for drying Hops, &c.

XIX. As I never met with any satisfactory Account of these *ancient Temples*, I imagined that a short Account of this one, which I met with in the County of *Corke*, in the Parish of *Kilgarriffe*, when I was upon a parochial Visitation, would not be unentertaining ; it stands about 10 Miles from *Bandon* to the S W.

As to the Drawing (*Fig. 34*) the Ground-plan is exact, but the Up- right (*Fig. 35*) was not taken upon the Place, but drawn from my De- scription of it. It contains the Representation of a very ancient Heathen Temple, and the Burial-place of some Person of great Renown, before the erecting of covered Temples was made use of, in this Part of the World, or perhaps in any other Part of the World, except *Judea*. Which Sort of Places of Devotion seem to be the most ancient of any that we have Accounts of in History. For *Temples* were originally all open, and thence received their Name, according to *Varro*, (*Lib. vi. de Ling. Lat.*) a *templando*, which was an ancient Word that signified to see or look out. These Places therefore were called Temples by the

Concerning the Remains of an ancient Temple in Ireland, of the same Sort as the famous Stonehenge, and of a Stone Hatchet of the ancient Irish, by the R. R. Rob. Lord Bishop of Corke, and F. R. S. No. 471. p. 281. Read Nov. 10. 1743. Fig. 34, 35.

* See Vol. V. Part ii. Chap. 2. §. xx. 3.

Heathens, because they were holy Places, that were marked out by the Augurs for taking their Auguries in; and were therefore left open, that the Priest or Augur, who stood with his Face to the South, according to *Rosinus*, (*Ros. Ant. Lib. iii. c. 9.*) or with his Face to the East, according to *Calepine*, (*Cal. Dict. Templum*) might be able to see all around him; his Art of Prediction depending on the Flight of Birds, or some Appearances in the Face of the Sky, which varied their Signification according as they shewed themselves, either on the Right-hand or Left-hand of the Augur. Whether the Disposition of these Stones, in the Plan, was designed or accidental, with regard to the Points of the Compass, I cannot say; but it is remarkable, that there are 2 Stones, which are fixed directly in the N. and W. Points of this Circle; and 2 Openings answering to the E. and S. So that it is possible both our Authors may be in the right, and that the Priest sometimes stood with his Face to the E. and sometimes to the S. The middle Stone, which was the Place where the Priest stood, is lower than the rest, not being above 3 Feet high, and was always dedicated to some Deity or other; and was consecrated to that Use by the pouring on of Olive-oil: Which Custom was of very ancient Date, and seems to have been borrowed from the Practice of the ancient Patriarchs, who called these Stones *Bethels*: For when *Jacob* was going from *Beersheba* towards *Padan-Aram*, or *Haran*, to seek for a Wife, by Command from his Father *Isaac*, having laid down to sleep, God appeared to him in a Dream; and, when he rose up in the Morning, it is said, that *he took the Stone which he had put for his Pillow, and set it up for a Pillar, and poured Oil upon the Top of it, and he called the Name of that Place BETHEL* (*Gen. xxviii. 18, 22*); which Word literally signifies in *English*, *GOD's House*. Again, when *Jacob* and *Laban* made a Covenant together, *Jacob took a Stone, and set it up for a Pillar, and probably poured Oil thereon, by Way of dedicating it to God, as he had done before; for that Moses made use of Oil in the Dedication of the Tabernacle, and Altar, and Vessels, &c. is plain from Lev. viii. 10, &c.* And in this Place, when *Jacob* and *Laban* had finished their Covenant, it is observed, that *Jacob offered up a Sacrifice*. (*Gen. xxxi. 45, 54.*) Again, when *Jacob* afterwards fled from the *Shechemites*, God appeared unto him; and in the Place where God talked with him, it is said, that *he set up a Pillar, even a Pillar of Stone, and poured a Drink-offering thereon, and he poured Oil thereon. And Jacob called the Name of the Place where GOD spake with him, BETHEL*. (*Gen. xxxv. 9, 15.*) And hence these Stones, which were erected as Marks of these Places having been dedicated to God, came to be called *Bethels*; and, by a corrupt Pronunciation of the Word, they were in *Greek* called *Βαῦλα* (*vide Sanchoniatho*). Which is the Reason why that Stone, which *Rhea* is supposed to have given *Saturn* to swallow instead of a Child, is called *Βαῦλος*; and not because it was covered with a woollen Garment, which is called *Βάιν* in *Greek*, as *Hesychius* pretends. *Hesych. Etym.*

And

And that this Custom of dedicating single Stones to God was not confined to *Judea*, is plain from *Clemens Alexandrinus*, who observes, that before the Art of Carving was invented, the Ancients erected unwrought Pillars, and paid their Worship to them as to the Statues of the Gods. (*Clem. Alex. Strom. Lib. i.*) *Herodian* also mentions a Pillar, or large Stone, of a black Colour, and a conical Form, at *Antioch* in *Phœnicia*, which was erected in Honour of the Sun. (*Herod. Lib. v.*) *Pausanias* also mentions several of these uncarved Pillars in *Bœotia* in *Greece*, and says they were the ancient Statues erected to their Gods. (*Pausan. in Bœot. & in Acha.*) And that this Custom continued till after the Time of the Prophet *Isaiab*, is plain from his making use of the Expression of erecting a Pillar to God, to denote the Worship of God: For, says he, *In that Day shall there be an Altar to the Lord in the midst of the Land of Egypt, and a Pillar at the Border thereof to the Lord. And it shall be for a Sign, and for a Witness, unto the Lord of Hosts in the Land of Egypt.* (*Isa. xix. 19, 20.*) And *Arnobius*, who flourished about 330 Years after *Christ*, says, that this Custom continued to his Time; and that, when he was a Heathen, he never met a Stone, which had the Marks of Olive-oil being poured upon it, that he did not look upon as something divine, and offered up his Prayers to it as such. (*Arnob. cont. Gent. Lib. i.*)

As to the Custom of erecting this *Bethel* with a certain Number of Stones around it, this also is to be found in the Old Testament. For it is said of *Moses*, after he had been in the Mount with God, and had returned to the People of *Israel*, that *he rose up early in the Morning, and builded an Altar under the Hill, and twelve Pillars according to the twelve Tribes of Israel.* (*Exod. xxiv. 4.*) Which Altar was probably surrounded with these 12 Pillars, or 12 large Stones, pitched on an End, and stuck in the Ground; for so the Word *מַסֵּבָה*, *Matsēbah*, literally signifies; as a proper Designation of the Quantity of Ground, which ought to be looked upon as sanctified by the Altar, and dedicated to God. Of the same Kind also we may suppose those 12 Stones to be, which *Joshua* pitched in *Gilgal*, after the Children of *Israel* had passed the River *Jordan*. (*Josh. iv. 20.*) The Number of Stones which surrounded these *Bethels*, I suppose therefore were entirely voluntary, at the Discretion of the Persons who dedicated the *Bethel*; and might be fewer or more, either according to the Number of Persons principally concerned in the Dedication, or the Size of the Place, or the Number of Stones which could conveniently be found large enough for that Purpose. The Number of those, of which I have sent the Draught, are 9, which surround the *Bethel* at 15 Feet and half Distance from the Centre; the Height of each Stone is about 6 Feet above-ground, and their Breadth is from 3 $\frac{1}{2}$ Feet to near 4 Feet, some a little more, and some a little less.

The Stone marked (b), which stands detached from the rest, I take to be a *Matsēbah*, or Pillar erected as a Memorial of the Burial-place of

some eminent Person; either the Prince or Priest of the Country, or probably both: For anciently the principal Person of each Family, Tribe, or Nation, officiated both as Prince and Priest: And in *Hebrew* the same Word *Cohen* signifies both Prince and Priest. And what confirms this Opinion of its being a sepulchral Monument is, that some of the ancient Popish Families hereabouts make use of it as a Burial-place to this Day. The first Account we have of this Custom of erecting Stone Pillars on or near the Burial-place of eminent Persons, is that of *Rachel's*, who dying in Child-birth of her Son *Benjamin*, in the Road between *Bethel* and *Ephrah*, it is said, that *Jacob* set a Pillar upon her Grave. (Gen. xxxv. 20.) Of the same Kind also may we suppose that *Masebah* or Pillar to be, which *Abfalom* erected for himself during his Life-time, though better wrought, and more ornamental, in the King's Dale; where it is more than probable he designed to have been buried; for it is observed that he said, *I have no Son to keep my Name in Remembrance, and he called the Pillar after his own Name.* (2 Sam. xviii. 18.) Which Custom, of erecting Pillars over the Burial-places of eminent Persons, was not confined to the Land of *Judea*; but was universally practised, as appears from a Passage in *Homer*, where *Minerva* exciting *Telemachus* to go in Quest of *Ulysses*, and supposing the worst that could happen, that is, that he should come to a certain Knowledge of the Death of his Father, she directs him then to raise a Pillar, or Signal, to his Memory.

And hence, in my Opinion, came the Origin of *Obelisks* in *Egypt*, which abounding with the finest Quarries in the World, gave them an Opportunity of pitching Stones of the largest Size over the Burial-places of their eminent Men. And you may observe, that this Stone, of which you have the Plan marked (b), is somewhat in the Form of an *Obelisk*, being 10 Feet high, and 2 Feet square at the Bottom, diminishing gradually to a Point at the Top.

It is remarkable, that some of these Stones manifestly appear to have been reduced to the Form they are in by Art, particularly that one last mentioned, as well as the one marked N. 7, which is reduced into an hexagonal Form, the inward and the outward Front being similar, with an Angle in the middle, as represented in the Ground-plan. There is no Appearance of any Mark of a Tool, so that it is probable, that this was done with great Labour, by the Assistance only of sharp Stones; which, before the Invention of Iron, or of that Metal's being common, seems to have been the usual Instrument of Operation in other Circumstances as well as this. For it is observed of *Zipporah*, the Wife of *Moses*, when she was ordered to circumcise her Son, that she took a sharp Stone, and cut off the Foreskin of her Son. (Exod. iv. 25.) And, when God orders *Joshua* to circumcise the *Israelites*, he says, *make thee sharp Knives*, as we translate it; but, in the Original it is, *Knives of sharp Stones.* (Josh. v. 2, 3.)

Herodotus and *Diodorus Siculus* both take Notice, that it was the Custom among the ancient *Egyptians*, at the Time of embalming the Dead, to cut open the Body with an *Ethiopic Stone*: (*Herod. Euterp. Diod. Lib. i. c. 5.*) And *Ovid*, in describing the Origin of the Customs of the *Corybantes*, &c. says, that a *Phrygian Youth* with whom the Goddess *Cybele* was in Love, and to whom he proved faithless, for a Punishment* to himself, cut himself all over with a sharp Stone; *Ille etiam saxo corpus laniavit acuto*, &c. (*Ovid. Fast. 4.*)

It is manifest, indeed, that the Use of Iron was found out in *Egypt* before the Time of *Joshua* and *Moses*, both of whom mention it as made use of not only for cutting of soft Things†, but also for chizelling of Stones. (*Deut. xxvii. 5. Josh. viii. 31.*) But I apprehend it must have been very rare, and that the Art of reducing of Iron to the Hardness and Consistency of Steel, was not yet discovered; because, when God orders *Joshua* to write the Words of the Law upon Stones, as soon as he had passed over *Jordan*, the Way he is ordered to do it is this; to plaster the Stones over with Plaster first, and then to grave in this Plaster the Words of the Law. (*Deut. xxvii. 2, 3.*) And yet this is called both by *Moses* and *Joshua*, writing upon the Stones. (*Deut. xxvii. 8.*)

It is certain, that the Art of polishing of Jewels, and of cutting one hard Stone with another that was harder, was invented and practised in *Egypt* before the Time of *Moses*; for he speaks of graving the Names of the Children of *Israel* in two *Onyx-stones*, which, being harder than Iron, even than Steel, are not to be wrought upon therewith; but must be cut by some Stone which is harder than themselves. Wherefore *Moses* says, *with the Work of an Engraver in Stone, like the Engravings of a Signet, shalt thou grave the two Stones*. (*Exod. xxviii. 9, 11.*) And therefore the Prophet *Jeremiah* mentions a *Pen of Iron*, as made use of for engraving. (*Jer. xvii. 1.*)

But the Use of Iron does by no Means seem to have been found out in these Western Parts of the World till much later; and therefore it is probable, that the Inhabitants of these Countries made use of Stones, which were the original Instruments used in cutting both for domestic and military Service, in all Countries of the known World, as appears of late Years from the Practice of the *Americans*. And it is also manifest, from the many Instruments of War, that are made of Stone, which have been dug up in these Western Parts of *Europe*, that the Use of Iron was not very common in these Parts, till of late Years. *Montfaucon*, in the IVth and Vth Tome of his *Antiquities*, gives us an Account of several Tombs being opened near *Paris*, and in other Places; wherein the hard and destructive Part of the Weapons found therein consisted of Stone. He particularly gives us the Cut of a Stone Hatchet

* Of the Antiquity of this Practice, see *Lev. xix. 28.*

† *Joseph*, when he was sent for by *Pharaoh*, shaved himself, *Gen. xli. 14.*

Fig. 36.

in his own Possession, which was made of Touchstone, in the IVth Tome of his Supplement, p. 30. But as I have at present in my Possession a much more compleat one, made of the same Kind of Stone, I have sent you the Draught of it done with Exactness, by a Scale of $\frac{1}{4}$ of an Inch to an Inch, and you will see, that it is plainly made for doing Execution both Ways, and therefore answers the Description given by Montfaucon of the *Amazonian* Hatchet, or the *Sagaris* of *Xenophon*. (vide Montf. Tome IV. p. 69.) The Handle is made of Yew, and the Stone is not inserted into the Handle at right Angles, but makes an acute Angle below towards the Hand; the Use of which appears at first Sight.

CHAP. II.

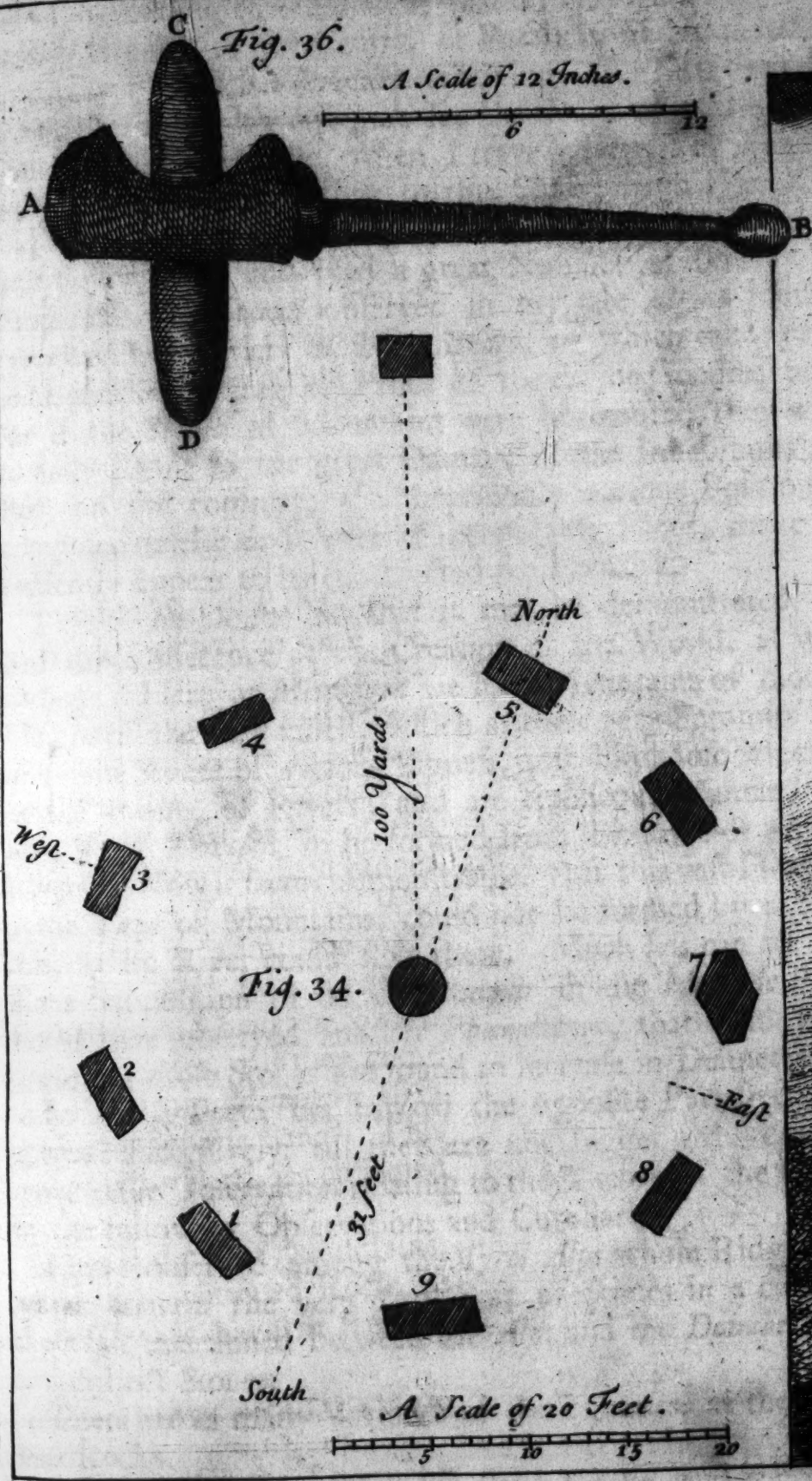
VOYAGES and TRAVELS.

Observations
made in a
Journey over
the Tyrol
Alps, by Bal-
thasar Ehr-
hard, M. D.
No. 458. p.
547.

I. HAVING spent 5 Days in travelling over several Mountains, equal in Height to those of *Switzerland*, I did not meet with any petrified marine Bodies, either *conchitæ* or *nautilitæ*, though I sought diligently for them; which is a Contradiction to *Woodward's* Hypothesis, May there not be Tracts of Sea equally spacious, and void of Inhabitants, or marine Animals, on account of Veins of Metal, Bitumen, or Vitriol? On this Principle, 2 Years ago, I proposed to the States of *Holland* a Remedy against the *Teredo*, or Worm that eats their Piles.

The different Qualities of the *Alps* afford no mean Argument of the divine Providence. In my whole Journey I saw only one Mountain that afforded Hay. It is called *Heuberg*, and lies near the Village *Pichelbach*, and affords so great a Plenty, that the neighbouring Towns are supplied from it with Hay, to feed their Cattle during Winter. This is owing partly to the thick Coat of Earth, with which it is covered, partly to the Veins of Clay and Marle, which lie under this Coat, and exude a plentiful Quantity of Water all over the Mountain. It is a known Thing, that subterraneous *Strata* of Clay and Marle are appointed by God to perform the same Effects, which Men produce by Pipes under-ground. I shall add another Reason, that in this Mountain there is a smaller Quantity of metallic Vapours, to injure the Roots of Vegetables. But, this being granted, I see no Reason why among 100 other Mountains, not one should be comparable to this in Fertility. Where then is that absolute physical Necessity? None, surely; but it is a Sample of free divine Will and Providence.

As I often considered the Direction of the stony *Strata*, in other Mountains, which, on account of the vast Number of Rocks, were as barren



in his own Possession, which was made of Lead
 Tome of his Supplement, p. 30. But as I have not
 Plate VIII. Vol. IX. part 4. page 462.

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 a Sample of free divine Will and Providence.
 Where then is that absolute physical Necessity? Not
 too other Mountains, nor one should be comparable

barren as the *Libyan* Deserts, I observed the Variation of the *Strata* through all Angles, from parallel, oblique, and perpendicular. Wonderful, according to *Woodward*, that all the *Strata* after the Deluge were exactly circular to the Centre, or Parallel; and that now there should hardly ever be such a *Stratum* remaining, of which the pure Parallelism should be found to continue for the Space of an Hour's Journey. I found it quite otherwise, when I travelled ten Years ago through *Germany*, chiefly with a View to this Study, from *Zurich* to *Hamburg*, and from *Dresden* to *Amsterdam*, having first laid a Foundation of physical Knowledge, and read a great Number of Books on that Subject. From the *Phænomena* observed in my late *Alpine* Journey, I plainly perceived the Variety of stony *Strata*, of which the *Alps* are composed, to be another irrefragable Proof of the divine Goodness and Providence; for if the *Strata* of Mountains were horizontal, they would be subject to daily Ruin, to the great Damage of the Inhabitants and Travellers. But, on the contrary, the surprisngly various Position of the *Strata*, composed chiefly as it were of converging Lines, make the Mountains evidently appear to be constructed for Eternity.

I make no Doubt but that it may be demonstrated, that the *Strata* had this Difference at the Creation of the World, as well as since the Deluge. Here at *Memingen* we have Mountains of more than half the Height of the very tallest, which at their very Summits have vast *Strata* of round Stones of various Bigness, just like those which are so formed by the rolling of Rivers; and are erroneously fancied by *Gassendi*, in his Life of *Peireski*, to be formed from I know not what *Mucus* of the Rivers. Now it seems demonstrable, that this vast Heap of such Stones at the Tops of Mountains, could not be formed by a Torrent of Waters, as no River could flow there. Much less can we admit the ingenious Supposition of *M. de Reaumur* in the *Mem. de l'Acad. R. de Sc.* For I have observed another *Phænomenon*, that from *Memingen* toward the *Alps*, those Stones are found to increase in Diameter, till they come to be 3 or 4 Feet; but toward the opposite Part from *Memingen* they decrease successively, till they are not bigger than coarse Sand. This remarkable Observation relating to the Theory of the Earth is confirmed by the following Observations and Corollaries.

I have observed among the *Tyrol Alps* whole Ridges of Mountains, which contain the very same Sort of Stones in a continued Rock, as those last-mentioned between the *Alps* and the *Danube* have in separate and distinct Stones.

There are as many Varieties of those Stones, as there are of these *Alpine* Rocks.

The Cause which broke the *Alpine* Rocks, and rolled the Fragments about till they were round, and overspread all that Part of *Germany* which I inhabit, must have been a very great Deluge; but I question whether it could be that of *Noah*.

The

The Waters of such a Flood, in the same Tract of 20 Leagues in Length, and as much in Breadth, were at that Time directed constantly from South to North.

The Fragments of the broken Mountains, which were twice as high before the Deluge, being rolled about by the Waters, have decreased in Bulk in Proportion as they have been farther rolled. Hence the greatest Pieces are found in the Places nearest the Mountains; and to those at a greater Distance are smaller, and some not bigger than coarse Sand.

The most exact Likeness of the least of these Stones, to the greatest of the *Alpine* Rocks, is evident to the Sight.

But amongst the most remarkable Pieces, with which the whole Province of *Swabia* is covered, I have not yet seen any that are composed of Metal, whereas in the *Alps* there are whole Mountains that abound in Metal. Therefore before the Deluge, either the Veins of Metal were covered by huge Heaps of Rocks, - or else the Ore has wasted in the Fragments that have been torn off; whence many Stones are found in *Alemania*, that seem hollow like Honey-Combs.

I shall now speak a Word or two of the Salt-Pits at *Hall* in *Tyrol*. As every Mountain of the *Alps* represents the whole World, and has it's torrid, frigid, and temperate Climate; that Part of the Ridge of Mountains which contains the Salt-Pits, is strongly exposed to the S. and is, in my Opinion, more scorched in many Places by the Summer-Sun, than the Countries under the Equinoctial Line.

The Connexion of Fossils is a *Phænomenon* hitherto but little known or observed. At *Hall* in *Saxony* the Salt-Pits are accompanied by a softer Sort of grey Stones like Clay. Above them are *Strata* of a red-dish Marble, covered by Pieces of a Sort of *Selenites*. Not far from the Salt-Pits is Plenty of a bituminous Fossil, or Coal: So at *Hall* in *Tyrol* I have with great Pleasure observed a like Concomitance of Fossils, the Difference between them being only this, that the Water is saturated with Fossil-Salt naturally in *Saxony*, but artificially in *Tyrol*. For here the Vein of Salt being muddy, must be washed in subterraneous Chambers for that Purpose, and when a *Lee* is thus prepared, the Salt is obtained from it by boiling. The Roof of this Chamber is of Stone, and the Floor of Clay. But this Structure is found in many Parts of the *Alps*; so that here is a new Instance of the Difference between the divine Power and human Architecture. But *Becher's* Account is false, that the subterraneous Chambers, being deprived of their Fossil-Salt, by letting in the Water, are filled again by the Salt growing anew: But this I first discovered myself, that from the black Mud first deprived of the Fossil-Salt by washing, there shoots a bitter Salt, exactly like the *Epsom-Salt*; so that the People of *Tyrol* might, if they would, provide a very great Quantity of it, to furnish the rest of *Germany* with it, instead of the *English* Salt. But whether Fossil-Salt is generated under the Earth after the Manner of Vapours, I have not been able to discover:

cover: But the Miners know nothing of those suffocating Steams, which are so frequent in the Saxon Works, and known there by the Name of *Schwaden*.

I shall only add an Observation concerning the Dialect of *Aleman*, or *Upper Swabia*, that it has so many Diphthongs, such Ways of pronouncing, and such Words, as to be very like the *English*, but especially the *Welsh*; and affords a sufficient Proof, that the *Suevi* and *Angli* were in the most ancient Times the same Nation. This is difficult to be proved from History, but is evident from this Argument.

II. * I have observed many gross Mistakes in Peoples Notions of *Virginia*, when discoursing of the Natives, which have risen from the Want of making a Distinction in their Expressions, when they speak of the *English* or *Whites* born there, and so called *Natives*; and the *Aborigines* of the Country. Please therefore to take Notice, that when I speak of the Natives in general, I mean only the *Indians*.

As therefore to your first Query: Their *Wiobist*, that is, their Priest, is generally their Physician; and is a Person of the greatest Honour and Esteem among them, next to the King, or to their great War-Captain.

2. Nature is their great Apothecary, each Physician furnishing himself, according to his Skill, with Herbs, or the Leaves, Fruit, Roots, or Barks of Trees; of which he sometimes makes use of the Juice, and sometimes reduces them into Powder, or perhaps makes a Decoction thereof.

3. Though every one, according to his Skill, is a Sort of Doctor, (as many Women are in *England*) yet their Priest is peculiarly stiled their Physician, to be consulted upon greater Emergencies. The Rules of the Descent hereof, as to Families, I do not know; for they are a fullen, close People, and will answer very few Questions.

4. They reward their Physician with no certain Fees, but according as they bargain for *Wampampeake* Skins, or the like. If it be to an *Englishman* they are sent for, they will agree for a Watch-coat, a Gallon or two of Rum, or soforth, according to the Nature of the Cure. Sometimes the Priest will sell his Remedy; for some of them have told me, that they have bought the Root which cures the Bite of the Rattlesnake from their *Wiobist*.

5. Their King allows no Salary, that ever I heard of; but every one that in any Nature can serve his Prince, is ready to do it, and to do it gratis.

6. They have no Consultations, their Practice being merely empirical. They know little of the Nature or Reason of Things. Ask them any Question about the Operation of a Remedy, and, if in good Humour, perhaps they will reply, *It cures*; otherwise, they will shrug their Shoulders, and you may ask forty Questions, and not know whe-

A Letter from the Rev. Mr. John Clayton, (afterwards Dean of Kildare in Ireland) to Dr. Grew, in Answer to several Queries relating to Virginia, sent to him in 1687, communicated by the R. Rev. Robert Lord Bishop of Corke, to John Earl of Egmont, F.R.S. No. 454. p. 143. July, &c. 1739.

* This may serve as a Sequel to the Accounts of *Virginia* formerly given by Mr Clayton. See Vol. III. Part ii. Chap. 3. §. xix.

ther they understand either the Thing, or what it is that you say to them.

7. They pay a certain Deference of Honour to their Priest or *Witch*, whose Person they hold sacred; but Laws they have none (as far as I could ever learn) that binds them thereto: In general, the Will of their Prince stands for Reason and Law.

8. The Means whereby they convey their Art to Posterity, I take to be this: They lodge in their *Wiochisan* Houses, i. e. their Temples, certain Kinds of Reliques, such as Mens Skulls, some certain Grains or Pulse, and several Herbs, which are dedicated to their Gods, viz. the Skulls in Memory of their Fights and Conquests; the Pulse by Way of Thank-offering for their Provisions; and the Herbs upon the same Account, for some special Cure performed thereby. For when any one is cured by any Herb, he brings Part thereof, and offers it to his God; whereby the Remembrance of this Herb and it's Virtue is not only preserved, but the Priest also becomes best instructed thereby, and knowing in the Art of Medicine: For otherwise they are mighty reserved of their Knowledge, even among themselves. Whether the Priest takes certain Persons to instruct, or teaches only his own Children, I know not. Often when they are abroad hunting in the Woods, and fall sick, or come by any Hurt, they then are forced to make use of any Herbs which are nearest at Hand, which they are not timorous in venturing upon, though they know not the Virtue or Qualities thereof. And thus, by making many Trials and Experiments, they find out the Virtues of Herbs; and by using simple Remedies, they certainly know what it is that effects the Cure.

9. They are generally most famed for curing of Wounds, and have indeed various very good Wound-herbs, as an Herb commonly called *Indian-wood*, which perhaps may be referred to the *Valerians*, and be said to be *Platani foliis*. They use also the *Gnaphalium Americanum*, commonly called there *White Plantain*. As to our *Plantain*, or the *Heptapleuron*, they call it the *Englishman's Foot*, and have a Tradition, that it will only grow where they have trodden, and was never known before the *English* came into this Country. The most famous old Physician among the *Apomatick Indians*, as I was informed by a Person of a very good Understanding, used mostly an Herb which he shewed me, whose Leaf is much like *Self-heal* in Winter. I observed it was red underneath, and would at length appear tinged on the upper Side also: It makes a good Salve, only it fills a Wound too fast with Flesh. I took a Draught of this Herb, along with some others, which I have left in the North of *England*. The great Success they have in curing Wounds and Sores, I apprehend mostly to proceed from their Manner of dressing them: For they first cleanse them, by sucking, which, though a very nasty, is, no Doubt, the most effectual and best Way imaginable; then they take the biting *Persecary*, and chew it in their Mouths, and thence squirt the Juice thereof into the Wound, which they will do as if it were

were out of a Syringe. Then they apply their Salve-Herbs, either bruised or beaten into a Salve with Grease, binding it on with Bark and Silk-Grass. Colonel *Spencer*, the present Secretary of State of *Virginia*, told me of a very strange and extraordinary Cure performed by an *Indian* on one of his *Negroes*. The *Negro* was a very good Servant, wherefore his Master had valued him much; but by Degrees he grew dim-sighted, and was troubled with terrible Pains in his Eyes, so that with one he could see but a little, and none at all with the other; and as the Pain still increased, the Colonel was greatly apprehensive, least his *Negro* would be quite blind. Several Surgeons were sent for, who had tried to cure him, but in vain; when an *Indian*, coming to the House, said he would cure him; they told Mr Secretary thereof, who sent for the *Indian*, and agreed with him for two Quarts of Rum. The *Indian* told him, that he could save one Eye, but that the *Negro* would be blind of the other. The next Morning the *Indian* went a hunting into the Woods for his Herbs, and returned with them about Noon, which he bruised, putting thereto a little Water; and having pressed forth some of the Juice, he dropped some thereof into the Eye which he said would be blind, and laid the Herbs thereon, which he would have bound fast with Bark; but the Colonel called for some Linen Rags, and had it bound up therewith. He then intimated to the Colonel, that shortly after Sun-set the *Negro* would be mad, if his Medicine took Effect, but would come to himself again before Morning; wherefore strict Orders were given, that he should be well attended, and that nothing should be altered, let what would happen. All Things therefore being accordingly done as the *Indian* had directed, every Thing succeeded likewise as the *Indian* had foretold. Then, about 11 o'Clock the next Day, the Binding being removed, and the Herbs taken off from the Eye, the *Indian* bid the *Negro* hold down his Head, which when he had done, out dropped the crystalline and aqueous Humours. The *Indian* afterwards bound it up again, and by Degrees the *Negro* was freed from his Pain, and had perfect Sight with the other Eye. What the Herbs were, the Colonel could never learn from him, though he proffered him whatever he would demand.

10. The Distempers amongst the *English* Natives (for I cannot give so particular an Account of the Distempers most predominant among the *Indians*) are, *Scorbutical Dropsies*, *Cachexies*, *Lethargies*, *Seasonings*, which are an intermitting Fever, or rather a continued Fever with quotidian Paroxysms. These are now rarely sharp, but shew themselves in a lingering Sickness. The *Griping of the Guts*, mostly dry, and when the *Tormina Ventris* cease, they generally shoot into the Limbs, and fix there, in a terrible Sort of Gout, taking away the Use of the Limbs. Thus they will pine away to Skin and Bone, so that their Joints will seem dislocated, and their Hands utterly crippled. *Sore Throats*, which the last Year were very frequent, and deemed infectious, running generally through whole Families, and, unless early prevented, became a

cancerous Humour, and had Effects like the *French-Pox*. Likewise Pains in the Limbs, which I apprehended to have proceeded partly from the same Humour floating up and down the Body. These Pains are very exquisite, mostly nocturnal; for while they walk, if they have the Use of their Limbs, they feel the least Pain. The Oil of a Fish called a *Drum* was found very effectual to cure these Pains, and restore the Limbs. I was Eye-Witness when a very worthy Gentlewoman, who had lost the Use of her Limbs, was entirely recovered by the Use of this Medicine: For her Feet being anointed with this Oil, the Pains flew into her Head; her Head thereupon being anointed, the Pain descended again; then anointing both Head and Feet, she was recovered. There are three Sorts of Oils in that Country, whose Virtues, if fully proved, might not perhaps be found despicable: The Oil of *Drums*, the Oil of *Rattle-Snakes*, and the Oil of *Turkey Bustards*. The Oil of *Sassafras-Leaves* may be deservedly considered too, for they will almost entirely dissolve into an Oil. But to return: There is another Sort of Distemper, which I judge to be the *Lepra Græcorum*. And it may perhaps be no bad Conjecture, that this chiefly proceeds from their feeding so much as they do, on a delicate luscious Sort of Pork. Among the *Indians* they have a Distemper which they call the *Tawa*, which is nearly related to the *French-Pox*; which they are said to cure with an Herb that fluxes them: But this I have only by Hear-say.

11. The *Indians* mind neither the Pulse nor Urine, only judge by the common most remarkable Symptoms; and some pretend to form a Judgment from the Countenance, and are fond of being thought Physiognomists.

12. I never could find, that they practised the letting of Blood. They purge much with several Sorts of Roots of their own Country Growth, and vomit frequently with various Herbs. They sweat boldly and excessively, and after a very strange Manner: For they have their Sweating-Stoves always upon the Bank of some River; whence they rush forth in the Height of their Sweat, and run into the River, where they wash and bathe themselves very plentifully. They use no *Blistering-Plasters*, but are exquisite at Cupping. As the *East-Indians* use *Moxa*, so these burn with *Punk*, which is the inward Part of the Excrecence or Exuberance of an Oak. When they design to give a Purge, they make use of the following Herbs: *Poake-Root*, i. e. *Solanum bacciferum*, a strong Purge, and by most deemed Poison. The Roots of *Tytimal*, of which I have observed two Sorts; the one *Flore minimo herbaceo*, the other *Flore albo*. The Flower of this last is small, but large in Comparison with the other: They are *repentes*, and grow in old manured Grounds. They chiefly make use of the latter of these, and it is a most excellent Purge, though it sometimes vomits: It is a quick but moderate Worker enough; and has this Peculiarity, that it opens the Body in the *Gripes*, when other much violenter Purgatives will not move it. There is another Herb, which they call the *Indian Purge*: This Plant has

has several woody Stalks growing near three Feet tall, and, as I remember, *perfoliat*: It bears yellow Berries round about the Joints: They only make use of the Root of this Plant. They use also the *small Fleur-de-Lis*, whose Virtues, I believe, are not yet half known, for it has some extraordinary Qualities: It does not grow above a Hand high, flowers in *March*, and is very fragrant. They use also some Sort of the *Apocynum's*, particularly that which I think *Gerard* calls *Vincetoxicum Americanum*; for there are several Sorts of *Apocynum's*, I think 13 or 14, but they are not all purgative: For having got some of the Root from an *Indian*, which he assured me was the *Rattle-Snake-Root*, I thought the Root of an *Apocynum* (which may well be distinguished by that of *Rosæ Mariæ foliis*) was very like it, both in Shape and Taste, considering the one dried, and the other fresh: Wherefore I got some Quantity thereof, and carrying it in my Pocket, I ventured to eat thereof, little by little, till I believe I have taken a Drachm at a Time, to observe if it had any peculiar Operation on the Body; but could never find that it had.

They have likewise several Sorts of Herbs, wherewith they vomit; one of which is a little Sort of *Squills*. They likewise take the Leaves of a certain curious odoriferous Shrub, that grows in the Swamps, which I take to be the *lesser Sassafras*; they bruise them in Water, and then express the Juice, which they drink warm. The *Indian* Interpreter, who taught me this, prized it much, as excellent Physick, and said they found it a very sovereign Remedy. It is as odoriferous as any Shrub I ever smelt at in my Life: Whoever has once taken Notice of the Smell, cannot forget it, or be deceived therein afterwards, having something peculiar in it. The Name which the *Indian* gave me hereof, was *Wisochis*, which since I understand is the general Word for Physick.

13. The rest of their *Materia Medica* consists of Herbs, of which they have great Plenty, and seldom prescribe any Thing else. I have collected above 300 several Sorts, that were no *European* Plants; but I shall only mention those at present, whose Virtues I take to be most remarkable. And first, the *Sassafras-Tree*, whose Root is well enough known. It shoots forth it's Blossoms in *March*, which are yellow, and grow in little Bunches like Grape-Flowers, and which, when gathered and picked from the husky Bud, make a curious Preserve. Most *Sassafras-Trees* blossom, few bear Berries, but those that do are generally very thick: They are shaped much like those of *Dulcamara*, but are black of Colour, and very aromatic; I take them to have considerable Virtues. The *Gum-Tree*, which I refer to the Species of *Plane-Trees*, and distinguish it by it's Fig-like Leaf, only more sharply dented. It's Leaf smells much like a Lemon. Their Practice is to beat the Tree, and then pill off the Bark, and so scrape the Gum, which has Virtues like Turpentine, or rather more astringent and drying. This they usually mix with their common Turpentine, which is whiter and more Butter-

Butter-like, than the *Venice* or *Chios* Turpentine. *Query*, Whether better or no? The further Method of preparing this Medicine, as I am told, is this: They expose it to the Sun on Paper, where at first it rather seems to melt, but it will afterwards grow hard; they then beat it to a Powder, and administer it. They use much the young Buds of the *Populus*, *five Tulipa arbor*, a vast large Tree, extraordinary spacious, bearing Flowers about *April*, much like Tulips; it's Leaves are large, smooth, and well-shaped, which, together with the Flowers, render the Tree exceeding beautiful to behold. It bears it's Seed coniferous, and is an excellent Opener of Obstructions. The *Sorrel-Tree* bears a Leaf something like a Laurel, in Taste much resembling *Lujula*. They use it in Fevers, and, as I am informed, with good Success. This Tree grows plentifully on the South-Side of *James River* in *Virginia*; I cannot say I ever found it to the Northward. The *Swamp-Plum-Tree*, whose Wood they calcine, and make into Charcoal, which they beat to a Powder, then mix it with Grease, and make an Ointment thereof, with which they anoint the Body, and foment it very much, whereby they cure the *Dropfy*; for it opens the Pores to that Degree, that the Water runs down their Legs. Among their Herbs, I have had 40 several Sorts, or near that Number, shewed me as great Secrets, for the *Rattle-Snake-Root*, or that Kind of *Snake-Root* which is good for curing the Bite of the *Rattle-Snake*: But I have no Reason to believe, that any of them are able to effect the Cure. One Gentleman shewed me a certain Root, which was a *Smilax*, and assured me, that that was certainly the *Rattle-Snake-Root*. And afterwards, when I shewed Mr Secretary *Spencer* the same Root, he said that certain *Indians* had given him of the same Root for the *Rattle-Snake-Root*, and that he had some Quantity to send for *England*; but this Root is by no Means the same with that which I have mentioned before, in Answer to *Query* 12, which I said was like the Root of an *Apocynum*, which I myself obtained from an *Indian*, who seemed to prize it highly, having sewed it carefully up in Leather on the Inside of his Belt. Others have shewed me *Chrysanthemum ferulaceis foliis* for it; others *Chrysanthemum tragopyri foliis*. Again; general Report goes in Favour of the *Asarum Cyclaminis foliis*, which many therefore particularly call *Rattle-Snake-Root*. There are strange Stories told in Favour of an Herb called *Dittany*, which however is not of the *Dittany* Kind, but is only a Mountain *Calaminth*. This they say will not only cure the Bite of a *Rattle-Snake*, but that the Smell thereof will kill the *Snake*. But however, * I have some Reason to believe, that this Herb will not cure the Bite, nor that the Smell thereof will kill the *Snake*; for Colonel *Spencer* assured me, that he had an Opportunity of making an Experiment thereof upon a Dog which was bitten by a *Rattle-Snake*, to which he gave plentifully of the Juice of his *Dittany*, as they called it; but the Dog died nevertheless

* See *Miscel. Curiosa*, Vol. III. p. 352.

a Day or two after. And Mr *Wormley*, one of the Council of State in *Virginia*, told me, that being in Company with another Gentleman, he had an Opportunity of making the following Experiment; for seeing a *Rattle-Snake* in her Coil, they went and got a Bunch of this *Dittany*, and tied it to a Pole; then putting the *Dittany* that was thereon to the Nose of the *Snake*, it seemed to offend her, whereupon she turned away her Head, which they still followed with the *Dittany*; then the *Snake* fled, and they still pursuing her, she at last stretched herself out at Length, and lay seemingly dead. Then they laid the *Dittany* upon her Head, and went into a neighbouring House to refresh themselves; for they were tired with skipping about after the *Snake*. When they had staid near half an Hour, they returned to see their supposed dead *Snake*; but, behold! the *Snake* was fled; so that they then judged, that the *Snake* had only stretched herself out, because she had been tired with their Pursuit. I look upon it probable therefore, that some Accident of the like Kind may have first given Origin to this Story; the Person had tired the *Snake* not having regularly waited for the Event, but perhaps, to secure the Conquest, may have given the *Snake* a Stroke with a Switch upon the Back, which would have killed the *Snake* without the *Dittany*. But yet nevertheless, this Plant is of more than ordinary Virtues, and might not unprofitably be used by our Physicians. It may be referred to the Class of the *Calamintha montana*, *pulegii odore*, which has been transferred from thence into *England*, and I think is now pretty common, but is hotter and more sudorifick.

I will now mention to you an Herb, though unknown, yet worthy to be fetched from *Virginia*, yielded the Country nothing else: It is the Herb called there *Angelica*, but which I take to be *Libanotis vera latifolia Dodonæi*. It grows generally on a rich sandy Ground, on a declining Brow, that faces the rising Sun; the Root shoots deep into the Earth, sometimes near three Feet, very tender, and easily broken, of a white or rather Cream-like Colour; and being lactescent, yields a little Milk, thick and yellow as Cream; a very early Plant. It seldom flowers or seeds under five Years Growth; for I have fully and distinctly observed that Number of Years in the several Sorts of this Plant, by the Growth of those not come to Maturity to bear Seed; and it is observable, that those which do not seed, have rarely more than one Branch, which divides when it spreads, and subdivides itself still into three. The Leaf is much like our wild *Angelica*, only thinner, and more the Colour of a Willow-green. Those that seed, have a fistulous Stalk about the Thickness of *Dill*, a white umbelliferous Plant; the Seeds are much like *Angelica-Seed*, but from the Fragrancy of the Root, and it's being peculiarly bearded, I undoubtedly style it a *Libanotis*. It stops the *Flux*, and cures it to a Wonder. Again; it often loosens and purges the Bodies of those that are bound, and have the Gripes, especially if it proceeds from Cold; and prevents many unhappy Distempers. I have Reason to speak well of it; for it is to it, under
God,

God, that I attribute the saving of my own Life. I have known it give 14 or 15 Stools, whereas it will not move a Child in Health. I take it to be the most sovereign Remedy the World ever knew in the Gripping of the Guts, and admirable against Vapours. It is fudorifick, and very aromatick, and will not be concealed; for wherever it is mixed, it will have the predominant Scent. It is mostly called, by those who know it in *Virginia*, by the Name of *Angelica*: But shewing a Piece of the Root to a great Woodsman, to see whether he knew it, and could tell me where it grew, he seemed surprized to see me have thereof; and told me, that he kept an *Indian* once for some Weeks with him, because he was an excellent Woodsman, and going a hunting, (*i. e.*) shooting, they came where some of this Root grew: The *Indian*, rejoicing, gathered some of it, but was very careful to cut off the Top of the Root, and replant it: He then asked him, Why he was so careful? Whereunto the *Indian* replied, It was a very choice Plant, and very scarce; for they sometimes travelled 100 or 200 Miles without finding any of it. He then asked him, What Use it was of? To which the *Indian* answered, You shall see by and by. After some Time, they spied four Deer at a Distance; then the *Indian*, contrary to his usual Custom, went to Windward of them, and sitting down upon an old Trunk of a Tree, began to rub the Root betwixt his Hands; at which the Deer tossed up their Heads, and snuffing with their Noses, they fed towards the Place where the *Indian* sat, till they came within easy Shot of them; whereupon he fired at them, and killed a large Buck. The Truth of this Story I no further assert, than that I was told it by a Person of seeming Seriousness, who had no Inducement to tell a Lye, or impose upon me: But I have often taken Notice, that the *Indians* smell generally strong of this Herb. And I have since learned from others, that the *Indians* call it the *Hunting-Root*, which makes me more inclinable to give Credence to this Story. Another Gentleman, a white Native of that Country, when I once pulled a Piece of the Root out of my Pocket to bite thereof, (for I frequently carried some of it about me) asked me, If I loved Fishing? I required, Wherefore he asked me that Question? Because, said he, you have gotten some of the *Fishing-Root*. The *Fishing-Root*! replied I; pray why do you give it that Name? Because, said he, when we were Boys, we used to get some of it to lay with our Baits to invite the Fish to bite. This I can say of my own Knowledge, that having one Day got some Quantity of the Root, and likewise of the Branches, to distil the strong Scent, as I went home, palpably put me into a breathing Sweat. In the Night I was waked by a Rat, which ran over my Face, whereas I never at any other Time had the like happen to me; but will not be positive to conclude, that this Root was the Cause thereof, only the precedent Relations made me reflect thereon. There is another Root of the Species of *Hyacinths*, the Leaves whereof are Grass-like, but smooth and stiff, of a Willow-green Colour, and spread like

like a Staff upon the Ground; from the Middle shoots a tall long rush-like Stem, without Leaves, near two Feet high; on one Side grow little white Bell-Flowers one above another: The Root is black outwardly, but brown within. It is bitter, and I take it to have much the same Virtues as *Little Centaury*. Some call it *Ague-Grass*, others *Ague-Root*, others *Star-Grass*. I have likewise been told by several, of a Root which the *Indians* cure Bruises wonderfully with; but I apprehend it is the same Root with which the *Indian* cured the *Negro's* Eye afore-mentioned; for it operates much after the same Manner, according to their Relation, making the Patients mad for some Hours, if they be recoverable. It is not to be applied where the Skin is broken. They use it thus: They chew some of the Root in their Mouths, and then squirt it forth on the bruised Part, fomenting it well with their Hands; then they give a little to the Person bruised to chew, who must swallow the Juice, but spit forth the Root again, which they bind on the Part aggrieved. If the Relations I have had of Cures performed thereby, be absolutely true, the World has not yet discovered a more wonderful Remedy. I had it described to me by Colonel *Smith*, of the *Isle of Wight* County, to be like *Langue de Bœuf*, with a yellow Flower, and rough hoary Leaf, the Root yellowish, and tasted something sweetish like *Liquorice*. There are several others I might name, whose Virtues are by no Means despicable; such as the *Chrysanthemum platani foliis*, whose Root is very useful in *old Pains*, the *Sciatica* and *Gout*. It is a large Herb, grows betwixt five and six Feet tall. There are likewise many others, which bear some Analogy to the *European* Plants, such as *Solomon's Seal*, *Wood-Sage*, much better, I think, than the *English*; which the *Indians* use much for Infusions, and which they take as we do Diet-drink. *Little Centaury*, red, white, and yellow, &c. However, I never could find above 12 or 14 Plants, which were Natives of that Country, that agreed perfectly with any of our *European* Plants, but what had some notable Differences, if they were not rather to be reckoned a distinct Genus.

13. There go Traditions of their having an Art to poison their Darts; but I could never find any solid Grounds for that Report. I have observed, that in those Countries, upon an ill Habit of Body, the least Scratch is dangerous; and that, for all the Care that can be taken to prevent it, it often turns into a very desperate ulcerous Sore. Some Herbs there are of analogous Nature with *Hemlock*, whereof, I think, they know nothing further, than that they are to avoid them; but any Herbs, wherewith they poison their Darts, I never could hear specified. And as Persons engaged in long Marches are liable to many Accidents, which may contribute to an ill State of Health, when a slight Wound in Battle has then proved mortal; this I apprehend to have been the Cause, why the Physician has rather chosen to attribute the Death of his Patient to the Poison of the Dart, than the Want of Skill in himself.

14. As to their Morals, they are simple and credulous, rather honest than otherwise, and unpractised in the *European* Art of Lying and Dissimulation; but as to the brutal Passions, they are sottish and sensual as the Beasts of the Field.

15. They are almost always either eating or sleeping, unless when they go a hunting: At all Hours of the Night, whenever they awake, they go to the *Homing-Pot*, that is, Maze dressed in a Manner like our pilled Wheat; or else a Piece of Venison *barbecuted*, that is, wrapped up in Leaves, and roasted in the Embers.

16. They drink, I think, little besides *Succahannah*, that is, fair Water, unless when they can get Spirits, such as Rum, from the *English*, which they will always drink to Excess, if they can possibly get them; but do not much care for them, unless they can have enough to make them drunk; and I have heard it said, that they wonder much at the *English* for purchasing Wine at so dear a Rate, when Rum is much cheaper, and will make them sooner drunk.

17. They use *Tobacco* much, which they smoak in short Pipes of their own making, having excellent Clay, which I tried a little before I came for *England*, making Crucibles thereof, which I could not discern were inferior to the *German*. They make also neat Pots of the same Clay, which will endure the Fire for any common Uses.

18. They have no *Opium*, though in some old Fields upon *York River*, I found Poppies perhaps of no despicable Virtue. I have been told, that in Fevers, and when their Sick cannot sleep, they apply the Flowers of *Stramonium* to the Temples, which has an Effect like *Laudanum*. I have had asserted by many, that when the Soldiers were sent over to quell the Insurrection of *Bacon*, &c. they being at *James-Town*, several of them went to gather a Sallad in the Fields, and lighting in great Quantities on an Herb called *James-Town-Weed*, they gathered it; and by eating thereof in Plenty, were rendered apish and foolish, as if they had been drunk, or were become Idiots. Dr *Lee* likewise assured me, that the same Accident happened once in his own Family; but that after a Night or two's Sleep, they recovered.

19. Their *Sports* are Dancing, their *Games* are playing with Straws, which as I am not perfectly acquainted with, I find it hard to describe; I can therefore only tell you how it appears to a Looker-on: They take a certain Number of Straws, and spread them in their Hands, holding them as if they were Cards; then they close them, and spread them again, and turn them very suddenly, and seem very dextrous thereat. Their *Exercise* is Hunting, that is, shooting with a Gun, or with Bow and Arrow, wherein they excel. Their Women work, plant the Corn, and weave Baskets or Mats.

20. Several have been very old; I cannot say, that herein there is any remarkable Difference between them and the *English* Natives. If the *English* live past 33, they generally live to a good Age; but many die between 30 and 33.

21. I have been told, that one of their famous *Witchists* prophesied, that bearded Men (for the *Ameritan Indians* have no Beards) should come and take away their Country, and that there should none of the original *Indians* be left within a certain Number of Years, I think it was an hundred and fifty. This is very certain, that the *Indian* Inhabitants of *Virginia* are now very inconsiderable as to their Number; and seem insensibly to decay, though they live under the *English* Protection, and have no Violence offered them. They are undoubtedly no great Breeders.

22. Though they are sluggish by Nature, and slow of Speech, yet their Method of Expression seems vehement and emphatical, and always attended with strong Gesticulations. They are generally well proportioned, and for the most Part are rather taller than the *English*. They have all either a very dark-brown Hair, that may well be called black, or a Jet-black, all lank.

CHAP. III.

MISCELLANEOUS PAPERS.

South-Carolina, Charles-Town, Jan. 22, 1740-1.

I Began these Experiments the first of last March, and have continued them ever since, with the Loss only of a few Days; and propose to continue them till the Year is finished, afterwards shall make them a few Days in every Month, and as constantly as possible in epidemic Seasons.

What first induced me to enter upon this Course, was, that I might experimentally discover the Influences of our different Seasons upon the human Body, by which I might arrive at some more certain Knowledge of the Causes of our epidemic Diseases, which as regularly return at their stated Seasons, as a good Clock strikes 12 when the Sun is in the Meridian; and therefore must proceed from some general Cause operating uniformly in the returning different Seasons.

Keil, indeed, has obliged the World with his *Statical Experiments*, but these his extensive Practice made less perfect than he could have wished, having many deficient Days, and he seldom gives the diurnal Perspiration. Had these been carried on with all the Constancy possible, they could not have so clearly demonstrated the Changes made in the animal Economy, in the several Seasons, as would a Course of such Experiments made in our Clime, where those Influences are in a much

Extracts of
two Letters
from Dr John
Lining, Phy-
sician at
Charles-Town
in South-Carolina,
to James
Jurin, M. D.
F. R. S. giving
an Account of
Statical Expe-
riments made
several Times
in a Day upon
himself, for one
whole Year, ac-
companied
with Meteorological
Observations;
to which are sub-
joined six gene-
ral Tables, de-

duced from the more eminent Degree, and where the Excursions from Heat to Cold whole Year's Course. No. 470. p. 491. Read May 19, 1743.

are very considerable, and often sudden, I having seen 30 Degrees Difference in 24 Hours by *Fahrenheit's* Thermometer.

Sanctorius, it is true, lived in a warm Climate, and has deduced many useful Aphorisms from his Experiments; but then he has not left us the Experiments themselves: Hence we are not only deprived of the Authorities from whence he deduced his Aphorisms, but likewise of a long-continued Series of Experiments; from whence the Changes induced upon the human Frame, in the different Seasons, might have experimentally appeared.

From the Histories of the Air and epidemic Diseases, we learn what Constitutions of the Air are productive of certain Diseases: Were we, however, once furnished with a Course of Statical Experiments of one whole Year, together with the History of the Weather, we, probably, might have more distinct Views of the Nature of the Diseases themselves, by knowing experimentally the Changes produced in our Constitutions, disposing us to such and such Diseases, in certain Periods of the Year.

To these Tables I likewise would have added an Analysis of a little of my own Blood and Urine, in every Month, with the Blood's Cohesion, could I have got the Instruments: But that I propose afterwards to do, if I can get the same Kind which *Dr. Langrish* analysed the Blood, &c. with, and an Instrument exactly the same with his, for measuring the Blood's Cohesion.

The Method I have observed in the Tables is this:

I weigh myself twice every Day, once in the Morning immediately after I rise, and again before I go to Bed at Night. As in *July 1*, my Weight at 6 $\frac{1}{2}$ a. m. was $\text{lb } 165. 13. 0.$ at 10 in the Night was 167. 5. 4. &c. 312 was the Quantity of Urine excreted from 6 $\frac{1}{2}$ in the Morning, to 10 $\frac{1}{2}$ that Night: And 39 was the Urine from 10 p. m. of the first Day, to 7 $\frac{1}{2}$ in the Morning of the second Day. The Figures placed in the next Column, directly opposite to these Quantities of Urine, express the Quantity perspired in the same Space of Time; e. g. 368 and 33 was perspired betwixt 6 $\frac{1}{2}$ a. m. and 10 $\frac{1}{2}$ p. m. in the first Day, and 323 the Quantity perspired from 10 $\frac{1}{2}$ p. m. of the first Day, to 10 $\frac{1}{2}$ a. m. in the second Day.

The Number of Pulses I take in the Morning, and immediately before I go to Bed at Night.

In the Column titled Stools, the Quantity is in Ounces and Drachms. When the Figures are placed in the upper Part of the Column, that Excretion was in the Morning; when in the middle or lower Part of the Column, then it was in the middle of the Day, or in the Night before Bed-time. Where 1, 2, or 3, occur in a Column, they express the Number of Stools that Day, as in *July 6*, there were 3 Stools.

The

The Figures placed in all the rest of the Columns, are in Ounces and Decimals: The Calculations I made with a two Foot sliding Gunter's Scale.

In the Column Urine 24^h, you have the Urine of 24 Hours calculated each Day; because, as I do not always weigh at one Hour in the Morning, the Space of Time betwixt two Morning Weighings must be unequal; whence the Difference betwixt the Quantities of each Day does not appear; as from July 1, 6^h a. m. to July 2d 7^h a. m. is 25 Hours, and the Quantity of Urine in that Time amounts to 21¹/₂ Ounces, which, calculated to 24 Hours, is 20.62 Ounces. In the same Manner have I calculated the Perspiration of 24 Hours.

In the Column Urine diurnal 6^h, is the mean Quantity of 6 diurnal Hours Urine calculated; as July 1, from 6^h a. m. to 10^h p. m. being 16 Hours, the Quantity of Urine in that Time is 3.12; which, calculated to 6 Hours, (upon Supposition that the Urine was equally secreted in all these Hours, which we know never can be) amounts to 4.50 Ounces.

In the same Manner have I calculated the nocturnal Urine of 6 Hours, and the diurnal and nocturnal Perspiration of 6 Hours; which serves very well in the following Columns, to shew their Differences, where they are compared together. For the Space of Time in which the diurnal Urine and Perspiration are excreted, is much greater than that in which the nocturnal Urine and Perspiration are excreted; whence, without comparing them together, by taking their Means in equal Spaces of Time, their Difference would not appear, as it now does in these Tables at first Inspection.

In the Column Evacuation of 24^h, is the whole Quantity excreted in 24 Hours, which is found out by adding together the Stools, and the Urine and Perspiration of 24 Hours by Calculation; whence the exact Quantity retained, or *è contra*, in every 24 Hours, appear in the succeeding 2 Columns.

By these tedious Calculations I have endeavoured, as much as possible, to prepare the Tables for Use, that just Deductions may more easily be drawn from them.

In the Columns Quant. of Meats, and Quant. of Drinks, the Quantities are in Ounces and Drachms. The Weights I have used are Gr. 60 = 31, 38 = 31, 316 = 15 j.

The Cloaths in which I dress before I weigh myself are taken Care of, so that their Weight shall vary as little as possible in the different Changes of the Air's Humidity.

In the Summer, as Opportunity served, I weighed myself every Hour, second or third Hour, through the Day, to investigate the Difference of the Urine and Perspiration, in different Hours of the Day, under different Circumstances; one Table of which I now send you, in which the Urine and Perspiration are likewise in Ounces and Drachms, and is

found to be

to be read together with the Account of the Quantity of Meat, Drink, and Exercise used; e. g.

July 3d, betwixt $11\frac{1}{4}$ and $12\frac{1}{2}$, I drank $\text{℥}20$ of Punch, used no Exercise, was not exposed to the Wind, and was cloathed in a Holland Jacket unbuttoned: Made in that $1\frac{1}{4}$ Hour, $\text{℥}1$ of flammeous Urine, and sweated so excessively, the Heat of the Air I sat in being 87, that both my Shirt and Jacket being wet with Sweat, was obliged to shift: Whence, though the Perspiration was, no doubt, greatly diminished by the Coldness of the wet Cloaths, towards the End of the $1\frac{1}{4}$ Hour, yet I perspired betwixt $\text{℥}11\frac{1}{4}$ and $12\frac{1}{2}$, $14\frac{1}{2}$.—Having shifted, and being cloathed in a Holland Jacket and Chince Gown, was exposed, betwixt $12\frac{1}{4}$ and $2\frac{1}{4}$, to the third Degree of the Wind's Force; eat $\text{℥}10\frac{1}{2}$ of roasted Lamb, Bread, and Shallots, drank $\text{℥}40$ of Punch, and used no Exercise; in these 2 Hours made $\text{℥}3\frac{1}{2}$ of Urine, and, being exposed to the Wind, perspired only $\text{℥}12$, though I sweated a little all the Time, and though the natural Heat of the Air was the same as in the former Experiment.—The same Day again, betwixt $2\frac{1}{4}$ and $5\frac{1}{8}$, p. m. my Cloathing being the same, and using no Exercise, I drank betwixt $\text{℥}23$ and 25 more of Punch; and the Air being cooled by the Clouds overspreading the Heavens, the Quantity of Urine was greatly increased, amounting in these $2\frac{1}{2}$ Hours to $\text{℥}28\frac{1}{2}$; but the Perspiration was so much diminished, that the Quantity of humid Particles attracted by my Skin exceeded the Quantity perspired in these $2\frac{1}{2}$ Hours by $\text{℥}8\frac{1}{2}$. Two more Instances of this Attraction you have in the same Table; and, no doubt, it often occurs in the Summer, and might be discovered by any who can conveniently weigh themselves every second or third Hour of the Day. Here there was no Waste of the Fluids, the predisponent Cause, according to *Kril*, of such Attraction, but Reason to suspect the contrary, by drinking so plentifully of Punch.

The Punch, or *Diapente*, as I have improperly called it, is made thus: Take Water $\text{℔}2$, Sugar $\text{℥}1\frac{1}{2}$, recent Juice of Limes $\text{℥}2\frac{1}{2}$, Rum $\text{℥}3$. M. This is the Punch we commonly drink in the Summer; but that which we drink in the Fall and Winter is richer, having more Sugar and Rum, and less of the Acid. It is a pleasant, subacid, cooling, and exhilarating Drink; and proves an excellent Diaphoretic in warm Weather, and a good Diuretic in cold Weather.

The Barometer is a common portable one; the Diameter of it's Bore is about $\frac{1}{4}$ of an Inch.

The Thermometer is *Fahrenheir's*; the other Thermometer is made by *Thomas Heath* in London, and is divided into 90 equal Parts; 65 is the freezing Point, and 49 temperate. I suspect it to be the same with *Hauksbee's*, and have called it so in the Tables.

The Hygroscope is a Whipeord, prepared after the same Manner as that of the Society's in *Edinburgh*; the Difference betwixt it's greatest and least Length, by their Manner of Preparation, I found to be 5 Inches;

Inches; for which I made an Index 5 Inches long, and divided it into 100 equal Parts, the first of which is the Hygroscope's greatest Length.

These Instruments are conveniently placed on the Outside of a N E Window, in a large square Box, about 3 Feet broad, 6 high, and 1 deep; which is so constructed, that neither the Sun nor Rain can have Access to the Instruments, and is at the same Time sufficiently perfused to shew the Temperature of the Air, having a great Number of large Holes, regularly placed, and passing obliquely upwards, in both Sides, and in the Front, with Weather-Boards placed over each Range of Holes, so as to hang over them obliquely downwards; and has likewise a large Window in the Front, which is open from Morning to Bed-time: The Shutters of the Window are in many Places perforated obliquely upwards, that the Air may have a free Circulation through the Box when the Window is shut at Night.

In the Column *Face of the Sky*, I have only taken Notice of the Sky's Appearance from the *Zenith* to within about 30 Degrees of the Horizon.

C. Clouds.

I Small Rain.

2 Thunder.

T. Thick.

II Greater Rain.

S. Spread.

III Very great Rain.

L. Light.

The Characters for Rain express the Time in which it rained, according as they are placed in the Column. When in the upper Part, it rained in the Forenoon: In the middle, Rain about the middle of the Day: In the under Part, Rain in the Evening, or Night before Bed-time; and when placed upon the Lines which divides the Days, then it rained in the Night.

I have observed the same Rule with the Character of Thunder, in placing the upper Part of it *a* (2^a) in the same Manner as of the Character of Rain; and likewise have placed it in that Direction, by which the Point of the Compass where the Thunder began, may be known, the Part (*a*) pointing to the Place where the Thunder began, supposing the Points of the Compass to lie in the same Manner in the Tables as in Maps. The numerical Figures placed upon it's Left-hand, express the Degree, Violence, or Continuance of the Thunder, 4 being the greatest.

Of the Wind's Force, I am obliged to judge by my Senses: 4 Degrees of it being insufficient in such Experiments, I have made 8. For a small Increase of the Wind's Force has a considerable Influence in sweeping away the Heat of our Cloaths; and, thereby cooling the Skin, diminishes Perspiration.

The Depth of the Rain is in Inches and Decimals.

I make

I make 3 Observations, by these Instruments, of the Weather every Day, viz. in the Morning, and at Bed-time, at the same Hours in which I weigh myself, and the other at 3 p. m.

Heat of the Room is that where I sleep or sit, by *Fahrenheits* Thermometer; have mentioned in the *Observations Miscell.* when I was exposed in it to the Wind.

Thus have I now spent near one Year, with no small Labour, Confinement, and Expence, in the Loss of Practice, in making these Experiments and Calculations; and if they will be of any Service to Mankind, of which you are the most proper Judge, shall then obtain all I had in View, in entering upon the Course.

South-Carolina, Charles-Town, April 11, 1741.

Extract from
the 2d Letter.
Read May 19,
1743.

I will not take up your Time in giving you the Reasons which first induced me to undertake a Course of such troublesome Experiments for one whole Year, which I have now finished: However, I presume, that a Course of such Experiments, made in a Clime where the Excursions from Heat and Cold, in the different Seasons, are very great, and the Transitions often surprisingly sudden, these Experiments, I say, made almost every Day through the Year, wherein the Day's Urine and Perspiration are distinguished from the Night's, may be of some Use in illustrating the Nature and predisponent Causes of epidemic Diseases, which so regularly return at stated Seasons; and especially as nothing, I know of, is extant of that Nature, so compleat as I have endeavoured: But of this, Sir, you are the best Judge.

Least the Tables I sent you before, should be lost, I have again presumed to trouble you with this; and have sent one Table more of the Experiments, being the remaining Part of *July*, and likewise six general Tables deduced from the whole Year's Course; these general Tables containing so many Corollaries deduced from the whole, and exhibiting, at one View, the Changes made in the sensible and insensible Excretions through the whole Year, you may communicate to the *Royal Society*. All the *Means* in these Tables are calculated after your Method.

N. B. The Table for *July* would have taken up too much Room here: I therefore thought it better to insert only the general Tables, in order to give a general Idea of the whole Year's Observations, which would make a small Volume by themselves. *C. M.*

TAB. I

Tables of Statical Experiments.

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TAB. I exhibits the Quantity of Meats and Drinks in Inches and Decimals, and the Sum of all the Evacuations made at the Time of the Experiments; whence it appears evidently what Increase and Diminution is made in the human Body for a whole Year.

Days of Experiment.	Meat.	Drink.	Urine.	Perfp.	Stools.	Meat and Drink More Less than Evacuations.
March 13	297. 87	1282. 37	971. 50	548. 50	43. 00	17. 25
March 12	332. 12	1026. 37	793. 37	532. 37	46. 00	13. 25
April 13	310. 12	1096. 12	798. 62	591. 62	50. 25	34. 24
April 10	244. 75	854. 12	562. 37	506. 00	27. 87	2. 63
May 16	424. 25	1293. 37	880. 12	816. 37	61. 00	39. 87
May 14	367. 37	1431. 37	804. 37	927. 00	42. 00	25. 00
June 14	318. 12	1447. 50	739. 87	1000. 87	52. 75	27. 87
June 15	338. 37	1535. 87	780. 87	1069. 50	57. 12	33. 25
July 16	378. 37	1787. 75	787. 00	1301. 37	66. 50	11. 25
July 15	378. 12	1614. 50	569. 87	1387. 37	55. 75	20. 37
Aug. 15	398. 75	1591. 00	823. 87	1129. 37	50. 37	13. 61
Aug. 15	357. 37	1565. 62	838. 37	998. 12	76. 87	9. 62
Sept. 15	350. 00	1599. 25	669. 62	1199. 00	81. 75	1. 12
Sept. 15	352. 75	1244. 50	532. 12	1113. 75	52. 25	100. 87
Octob. 16	368. 62	1134. 50	749. 00	642. 75	80. 37	31. 00
Octob. 15	373. 75	1123. 87	729. 00	621. 50	110. 12	37. 00
Nov. 15	413. 62	1284. 00	981. 62	609. 37	64. 00	42. 63
Nov. 11	284. 75	882. 00	660. 62	442. 75	33. 25	30. 13
Dec. 13	343. 25	1186. 25	875. 12	555. 12	47. 25	52. 01
Dec. 14	383. 25	1285. 75	1036. 75	593. 75	53. 75	15. 25
Jan. 15	357. 62	1320. 75	958. 50	629. 75	50. 87	39. 25
Jan. 13	304. 75	1328. 37	1069. 50	489. 37	62. 50	11. 75
Febr. 15	382. 00	1381. 87	1138. 75	563. 87	48. 62	12. 63
Febr. 13	306. 62	1244. 75	1041. 37	484. 75	41. 50	16. 25

Tables of Statical Experiments.

TAB. II.

	Urine 24 ^h .			Perspiration 24 ^h .		
	Greatest.	Least.	Mean.	Greatest.	Least.	Mean.
March	102. 20	33. 40	70. 59	74. 75	28. 00	43. 28
April	87. 50	36. 00	59. 17	69. 40	34. 00	47. 72
May	88. 12	25. 25	56. 15	94. 00	30. 62	58. 11
June	85. 00	28. 70	52. 09	106. 90	36. 75	71. 39
July	92. 90	20. 62	43. 77	105. 00	51. 90	86. 41
August	76. 50	31. 00	55. 41	107. 00	38. 90	70. 91
September	78. 75	11. 15	40. 06	130. 00	42. 37	77. 09
October	73. 40	22. 45	47. 67	63. 10	30. 20	40. 78
November	99. 00	39. 50	63. 16	49. 30	29. 00	40. 47
December	143. 50	41. 00	70. 81	56. 60	27. 65	42. 55
January	121. 00	39. 75	72. 43	49. 25	33. 10	39. 97
February	115. 00	45. 60	77. 86	46. 10	24. 40	37. 45

TAB. III exhibits the mean Quantities of both diurnal and nocturnal Urine and Perspiration, which were secreted in every Month of the Year, in equal Times, and their Proportions to each other.

	Nocturnal Urine 6 ^h as 1 to		Diurnal Urine 6 ^h as 1 to		Noct. Persp. 6 ^h as 1 to		Diurn. Persp. 6 ^h as 1 to	
	6 ^h Mean	Noct. Urine	6 ^h Mean	Diurn. Urine	6 ^h Mean	Noct. Persp.	6 ^h Mean	Diurn. Persp.
March	18. 35	15. 10	10. 94	9. 90	1. 21	1. 12	0. 59	0. 65
April	16. 39	12. 33	13. 03	10. 24	1. 33	1. 27	0. 79	0. 91
May	13. 13	15. 58	16. 44	10. 64	0. 84	1. 54	1. 25	0. 69
June	12. 13	15. 37	20. 69	12. 68	0. 79	1. 63	1. 70	0. 82
July	09. 02	14. 14	26. 73	12. 43	0. 63	2. 15	2. 96	0. 88
August	12. 41	17. 02	21. 32	10. 08	0. 73	2. 11	1. 71	0. 59
September	10. 54	12. 22	22. 58	11. 07	0. 86	2. 04	2. 14	0. 90
October	10. 33	14. 30	10. 37	9. 88	0. 72	1. 05	1. 00	0. 69
November	16. 87	13. 88	10. 64	9. 92	1. 21	1. 07	0. 63	0. 71
December	19. 02	14. 51	12. 03	8. 19	1. 31	1. 47	0. 60	0. 56
January	21. 16	12. 46	11. 26	8. 22	1. 70	1. 37	0. 53	0. 66
February	23. 19	13. 31	10. 43	7. 56	1. 74	1. 38	0. 45	0. 57

TAB.

Qqq 2

	Meat.	Drink.	Food.	Urine.	Perfpir.	Stools.	Food Greater/Less than the Eva- cuations.	Food as 1 to the Urine as 1 to the	Food as 1 to Perfpir. as 1 to	Food as 1 to Stools as 1 to	Urine as 1 to Perfpir. as 1 to	Height of the Barometer.	Height of the Thermo- meter.	Height of the Hygroscope.	Quan- tity of Rain.					
May	758.82	2762.61	3521.43	2112.66	1298.33	107.15	93.29	1.66	2.71	32.86	0.61	30.40	29.60	80	34	57	25	4	12	1.141
June	724.92	2545.91	3270.83	1765.00	1442.12	99.74		1.85	2.27	32.89	0.82	30.48	29.58	83	51	67	14	2	7	1.092
July	791.35	2745.15	3537.59	1686.94	1759.56	102.19		2.15	2.01	34.61	0.43	30.30	29.90	87	56	74	30	2	9	5.612
Aug.	679.21	3086.76	3765.97	1573.58	2141.86	115.63		2.39	1.75	33.14	1.36	30.28	29.90	90	66	79	28	5	10	4.648
Sept.	732.85	3290.52	4023.37	1307.69	2607.41	118.10		3.07	1.54	34.06	1.99	30.22	29.98	91	70	81	30	4	11	3.013
Oct.	756.12	3886.62	3912.74	1662.24	2127.49	127.24		2.35	1.83	30.75	1.28	30.25	29.95	90	67	77	34	4	12	7.301
Nov.	702.75	2843.75	3546.50	1201.74	2312.74	134.00		2.95	1.53	26.46	1.92	30.36	29.86	84	56	75	19	6	12	3.200
Dec.	719.34	2187.47	2906.81	1431.19	1224.08	185.47	66.07	2.03	2.39	15.67	0.85	30.50	29.95	73	35	56	35	4	12	1.257
Jan.	801.93	2486.72	3288.65	1682.48	1213.12	109.33	83.72	1.21	2.71	30.08	0.64	30.95	29.73	67	32	52	31	3	14	1.848
Feb.	806.68	2746.34	3553.02	2120.60	1276.68	152.10	43.64	1.67	2.77	31.21	0.60	30.58	29.65	69	21	42	29	3	10	2.736
Mar.	709.25	2853.48	3562.73	2192.54	1194.49	122.99	52.80	1.62	2.98	28.90	0.55	30.65	29.54	63	31	45	40	6	18	4.492
Apr.	735.80	2818.12	3553.92	2340.3	1123.20	96.50		1.62	2.98	28.90	0.55	30.65	29.54	63	31	45	40	6	18	3.135
Total	8919.02	33624.45	42443.47	21277.00	19721.00	1428.44		1.66	2.71	32.86	0.61	30.40	29.60	80	34	57	25	4	12	39.475

TAB. V.

Because the Quantity of Food in each Column of the other Table is very different, so that the Increase and Decrease of any Evacuation, as they are affected by the Constitution of the Air, is not very manifest; therefore this Table is drawn up, supposing the Quantity of Food taken in every Month, or 30 Days, to be 3 3543. 40, which exceeds the Mean of 30 Days 3 8. 40; whence the Increase and Diminution of the sensible and insensible Evacuation through a whole Year are plainly shewn to be affected by the Temperature of the Air, as it is exhibited in TAB. IV.

	Urine.		Perspir.		Stools.		Weight.		Urine.		Perspiration.		Stools.	
	Increased	diminished	Increased	diminished	Increased	diminished	Increased	diminished	Increased	diminished	Increased	diminished	Increased	diminished
March	2127. 04		1307. 13		107. 87		03. 36							
April	1913. 16		1563. 17		108. 11		39. 04		213. 88		256. 04		00. 24	
May	1691. 27		1763. 49		102. 39		11. 75		321. 89		200. 32			05. 72
June	1481. 41		2016. 41		106. 94		59. 36		209. 86		252. 92		04. 55	
July	1152. 34		2297. 65		104. 07		08. 66		329. 07		281. 24			02. 87
August	1506. 18		1927. 75		115. 29		03. 82							
September	1201. 36		2312. 03		133. 95		101. 94		304. 82		384. 28		11. 22	
October	1745. 60		1492. 99		226. 22		80. 56		544. 24				18. 66	
November	2029. 42		1307. 82		117. 87		90. 29		283. 82		819. 04		92. 27	
December	2116. 05		1273. 94		111. 85		43. 56							08. 35
January	2181. 87		1188. 59		122. 39		52. 55		086. 63				33. 88	
February	2334. 72		1120. 20		96. 26				065. 82				85. 35	
							06. 09		152. 85				68. 08	
														26. 13

TAB. VI. being drawn from TAB. IV. shews the Sum of the Food and Evacuations, through the various Seasons of the Year, and exhibits the Proportions of them to each other.

	Food.	Urine.	Perspir.	Stools.	Weight.		Food as 1 to	Urine as 1 to	Perspiration as 1 to	Food as 1 to	Stools are to	Perspir. as 1 to	Urine is to
					Increas.	Dimin.							
Spring	10346. 18	6218. 00	3863. 65	303. 39		38. 86	1. 66	2. 67	34. 10	0. 62			
Summer	11326. 84	1568. 21	6508. 83	333. 92		84. 14	2. 48	1. 74	33. 92	1. 42			
Autumn	10366. 05	1295. 17	5661. 32	446. 71		40. 15	2. 41	1. 83	23. 20	1. 32			
Winter	10404. 40	6195. 62	3684. 20	344. 42	180. 16		1. 68	2. 82	30. 20	0. 59			

$\bar{3}$ 24.78 Meat }
 93.12 Drink } Mean daily Quantity.
 117.90 Food }

59.10 Urine }
 54.78 Perspiration } Mean daily Quantity of 24^h through the
 3.97 Stools } whole Year.

9042.92 Meat }
 33990.05 Drink } 365 Days.

4032.97 = $\bar{1}$ 2689 $\bar{3}$ 9 of Food taken in the Space of a Year.

The mean Morning Weight is to the whole Quantity of Food of one Year as 1 to 15 97, and to the whole Food of one Month as 1 to 1.34.

$\bar{1}$ 3 3

Jan. 19 - - - 177 00 4 Greatest }
 Oct. 1 - - - 159 13 6 Least } Morning Weight.

17 02 6 A great Difference between the Autumnal and Winter Weight.

168 07 1 Mean Morning Weight.

Urine }
 Perspiration } of the whole Year are to the Food as 1 to {
 Stools } 2.02.
 2.18.
 30.13.

The Perspiration of the whole Year is to the Urine as 1 to 8.

The Stools of the whole Year are to the Urine and Perspiration taken together as 1 to 28.7, and to the whole of the Meat of the whole Year as 1 to 6.24.

The least Winter Perspiration in 30 Days is to the greatest Summer Perspiration, in the same Time, as 1 to 2.06.

The least Summer Urine for 30 Days is to the greatest Winter Urine, in the same Time, as 1 to 2.03.

An Account of
the Standard
Measures pre-
served in the
Capitol at
Rome. By
Martin
Folkes, Esq;
V. P. R. S.
No. 442.
p. 262. July,
1736.

In the Wall of the Capitol is a fair Stone of white Marble, of the Length of 8 Foot 5 Inches *English*, and of the Breadth of 1 Foot 9 Inches and a half; upon which are inscribed the Standards of several Measures with these respective Inscriptions:

Piede Ro: Pal. III. Onc. XII. Deti. XVI.

Piede Greco.

Canna di Architet. Palmi X.

Staiolo Pal. V. Quar. III.

Canna di Mercat Palmi otto d' altra misura.

Braccio di Merc. Pal. III. d' altra misura.

Braccio di Tessito di Tela.

Curante Lu. Poeto.

The Lines that represent these Measures, are cut in the Marble, pretty deep; but as they have, consequently, a considerable Thickness, it is somewhat difficult to be very exact in taking off their Dimensions. I, however, attempted to do it as nearly as I could, by setting the Point of my Compasses in the Middle of the cross Lines, that are drawn to determine the Beginnings and Ends of the Measures. The Palm of the Architects is easier to give than the others, by reason the whole Canna is inscribed on the Stone: This I therefore took off, as I presume others have generally done, and then divided it into 10 equal Parts. Afterwards my chief Attention was given to the *Roman Foot*, as of greater Consequence than the other Measures. They all, however, follow as they occurred to me, in such Parts as the *London Foot* contains 1000 of.

The *Roman Foot* 966 $\frac{1}{4}$. This is divided upon the Stone, first into 4 Palms, and then on the upper Part into 12 *Unciæ*, and on the lower into 16 *Deti*, according to the Inscription.

The *Greek Foot* 1006 $\frac{1}{4}$. This is also divided like the *Roman*.

The *Canna* of the Architects 732 $\frac{1}{2}$. It is divided into 10 Palms, each of which is therefore 732 $\frac{1}{2}$ of the *English Foot*.

The *Staiolo* being 5 Palms and $\frac{1}{4}$ is 4212—.

The *Canna de Mercanti*, divided into 8 Palms of another Measure, 6 Foot 6 Inches $\frac{1}{4}$.

The *Braccio de Mercanti*, divided into 4 Palms of another Measure, 2 Foot 9 Inches $\frac{1}{4}$.

The *Braccio di Tessitor di Tela*, divided into 3 Parts, 2 Foot 1 Inch $\frac{1}{4}$.

The Palm of the Architects is assigned by Mr Greaves 732 of the *English Foot*; and the same is given by M. Picart to the *Paris Foot*,
as

as 494 $\frac{1}{2}$ to 720; which reduced, becomes 732 $\frac{1}{2}$ of the *English Foot*, as before, and as it came out from my own Trial.

The *Roman Foot* is given by *Picart* from this very Stone 653 $\frac{1}{2}$ of such Parts as the *Paris Foot* contains 720; that is, by Reduction, 967 $\frac{1}{2}$ of the *English*; and the same by *Fabretti*, who also measured it upon this Stone, is assigned to the Palm of the Architects, as 2040 to 1545; which reduced upon the former Measure of a Palm, is 966 $\frac{1}{2}$ of the *English Foot*. These Measures come out as near as the Nature of the Standard can possibly allow; and as it was somewhat fresher in *M. Picart's* Time than it is now, I would make no Difference in the Proportion he has assigned; but suppose the *Roman Foot* on this Marble was intended to be such a one as should contain 967 Parts of the *English* very nearly.

Mr Greaves had long before assigned the Measure of the *Roman Foot* from *Cossutius's* Monument, to be 967 of the *English*, and had preferred that Measure to the others he had taken from the Tomb of *Statilius*, and the *Congius* of *Vespasian*. And I think one can make no Doubt, from what has been said, but *Cossutius's* Foot was the Foot intended to be inscribed upon this Marble; though that Monument is itself now lost: At least when I was at *Rome* I could get no Intelligence of it, though I made a diligent Enquiry amongst all the People likely to be acquainted with it.

Fabretti, in his Work concerning Aqueducts, where he gives the above-mentioned Proportion of the Palm to the Foot, finds Fault with *Lucas Pætus*, as having made a wrong Calculation of this Proportion in his Book, *De Mensuris & Ponderibus*. True it is, that the Proportion there given by *Pætus*, does not agree with the Foot upon the Marble, but yet it is no false Calculation, as *Fabretti* thought; and had he examined *Pætus's* Book with Care, he would have been sensible this is not the Foot he there contends for, but the *Cossutian* Foot which *Lucas Pætus* in his Book disputes against. The Truth therefore is, that he either altered his Mind after the writing of that Book, before the Marble was set up; or, more probably, that though he had the Care of having these Measures inscribed on the Marble, he was directed by a superior Authority what Measures he was to have engraved; and that accordingly he had, as near as he was able, the *Cossutian* Foot described for the ancient *Roman Foot* on the Stone: And that this was the Case, and no Mistake about the Number, as *Fabretti* supposes, appears not only from the Tenure of his Book, where he condemns *Cossutius's* Foot, which there appears, but also from his Scheme at the latter End, where he has given what he calls *Scema pedis legitimi*, agreeing with his own Numbers, viz. 12 Inches, whereof 9 $\frac{1}{2}$ make the Palm of the Architects, and also the *Mensura Colotiani & Statiliani pedis*, agreeing with that now inscribed on the Marble. The *Colotian* is the same Monument as the *Cossutian*, so called from the Person in whose Possession it had formerly been; and he had before said, p. 5, that according to the

Testimony

Testimony of *Philander*, the *Statilian* agreed with it; though Mr *Greaves*, who measured both these Feet with great Care, found some Difference between them? stating the *Cossutian*, as above, 967, and the *Statilian* 972. But by *Pavus's* quoting *Philander*, it is plain he had not himself measured the latter; and therefore the Foot, called by him the *Colotian* and *Statilian*, is indeed purely the *Colotian* or *Cossutian* Foot; and the same has, occurred, to me also very nearly from my Measure of the Height of the *Trajan* Pillar, which I find, from the Ground to the Top of the *Cimatum* of the Capitol, to be 115 Feet 10 Inches $\frac{1}{2}$, and this Height divided by 120, gives very nearly 966 for the Quotient.

For the Greek Foot there seems to be no further Mystery, than that it was intended to be made to the Roman in the Proportion collected from *Pliny*, which is, that 625 Roman Feet made 600 Greek; by which Account the Greek Foot should contain 1007 of such Parts as the Roman contains 967; and the actual Quantity I took off was 1006.

An Account of
the Analogy be-
twixt English
Weights and
Measures of
Capacity by
the Rev. Mr
William Bar-
low of Ply-
mouth. No.
458. p. 457.
Sept. &c.
1740.

III. The Analogy betwixt ancient English Weights and Measures seems for many Ages to have been entirely forgotten and unknown.

Our Forefathers supposed a cubic Foot of Water (assumed as a general Standard for Liquids) to weigh 62 Pound $\frac{1}{2}$; the Exactness of which Supposition is confirmed by modern Observation: For in *Philos. Trans.* N^o 169, we find the Weight of a Foot of Pump-Water to be 62 Pound 8 Ounces. From a cubic Foot of Water multiplied by 32, is raised a Ton Weight, or 2000 Pound, luckily falling into large round Numbers, and for that Reason made Choice of.

Agreeably hereto were liquid Measures accommodated, viz. 8 cubic Foot of Water made a Hogshead, and 4 Hogsheads a Ton in Capacity and Denomination as well as Weight.

Dry Measures were raised on the same Model. A Bushel of Wheat (assumed as a general Standard for all Sorts of Grain) was supposed to weigh 62 Pound $\frac{1}{2}$, equal to a Foot of Water; 8 of these Bushels a Quarter, and 4 Quarters a Ton Weight.

Coals were sold by the Chaldron, which was supposed to weigh a Ton, or 2000 Pound. See *Chambers's Dictionary*.

Therefore, though the Measures containing a liquid Ton, 4 Quarters of Wheat, a Chaldron of Coals, &c. be all of different Capacities; yet the respective Contents are every one of the same Weight: A Ton in Weight is the common Standard of all.

In after Times, through Ignorance of this Analogy, a Variety of Weights and Measures were introduced, incommensurate, and not reducible to any common Standard, or analogous Relation: Whereas, had the original Analogy been kept up, it would have prevented that Disorder and Confusion so justly complained of at present concerning the Subject of Weights and Measures.

From the foregoing Scheme it is reasonable to suppose, that Corn, and several other Commodities, both dry and liquid, were first sold by

by Weight; and that Measures, for Convenience, were afterwards introduced, bearing some Analogy to the Weights before made use of.

From the modern Experiment before-mentioned, (a cubic Foot of Water weighing 62 Pound 8 Ounces) it appears, that the Measure of a Foot, and the Weight of a Pound, are the same now as were in Use many Ages before the Conquest.

The foregoing Scheme assigns a Reason, why the Word *Ton* is applied both to Weight and liquid Measure, viz. because the same Quantity of Liquor is a *Ton* both in Weight and Measure. Probably 4 Quarters of Grain had formerly the same Appellation, till the Significancy of it was lost in the Use of the *Avoirdupois* *Ton*.

The Word *Quarter*, as applied to Grain, is also hereby explained. Most Writers have supposed it the 4th Part of some Measure, but what that Measure was, could never satisfactorily be made out. The learned Bishop *Fleetwood* guessed nearest the Truth, supposing it the 4th Part—not of any Measure, but—of some Load or Weight [*Chron. Pretios.* p. 72]. I wonder he stopped here, and did not observe what that Load of Weight was, viz. a *Ton* or 2000 Pound: But the *Avoirdupois* *Ton*, in Use at present for all gross Weights, threw such a Mist upon the Subject, as could not easily be seen through.

From the original and natural Signification of the Word *Hundred*, it plainly appears, that *Twenty hundred*, or a *Ton*, must be exactly two thousand Weight.

IV. Some curious Gentlemen both of the *Royal Society* of London, and of the *Royal Academy* of Sciences at Paris, thinking it might be of good Use, for the better comparing together the Success of Experiments made in *England* and in *France*, proposed some Time since, that accurate Standards of the Measures and Weights of both Nations, carefully examined, and made to agree with each other, might be laid up and preserved in the Archives both of the *Royal Society* here, and of the *Royal Academy* of Sciences at Paris: Which Proposal having been received with the general Approbation of both those Bodies, they were thereupon pleased to give the necessary Directions for the bringing the same into Effect. In Consequence of which, Mr *George Graham*, Fellow of the *Royal Society*, did, at their Desire, procure from Mr *Jonathan Sisson*, Instrument-maker in *Beaufort-Buildings*, two substantial Brass Rods, well planed and squared, and of the Length of about 42 Inches each, together with two excellent Brass Scales of six Inches each, on both of which one Inch is curiously divided by diagonal Lines, and fine Points, into 500 equal Parts: And upon each of the Rods Mr *Graham* did, with the greatest Care, lay off the Length of 3 *English* Feet, from the Standard of a Yard kept in the Tower of London. He also at the same Time directed Mr *Samuel Read*, Scale and Weight-maker near *Aldersgate*, to prepare, in the best Manner he could, two single *Troy* Pound Weights, with 2 Piles of the same Weights, decreasing from 8 Ounces to $\frac{1}{4}$ of an Ounce respectively, two

An Account of the Proportions of the English and French Measures and Weights, from the Standards of the same, kept at the Royal Society. No. 465. p. 185. Read Nov. 11, 1742.

Parcels of the lesser corresponding Weights, that is to say, from 5 Dwt. to $\frac{1}{2}$ Dwt. and Grain Weights from 6 Grains to $\frac{1}{4}$ of a Grain; together with 2 single *Avoirdupois* Pound Weights: All which, when made, were carefully examined, and found to agree sufficiently with each other. Things being thus provided, the 2 Brass Rods, one of the Six-inch Scales, and one Set of all the Weights, were sent over to *Paris*, one of the Rods to be returned, and all the other Particulars, to be presented for their Use, to the *Royal Academy* of Sciences there: Who, upon Receipt thereof, desired the late M. *Du Fay*, and *Abbé Nollet*, both Members of the *Academy*, and also Fellows of the *Royal Society*, to see the Measure of the *Paris* half Toise, containing 3 *Paris* Feet, accurately set off upon both the Brass Rods, in the like Manner as the Length of the *English* Yard, containing three *English* Feet, had already been set off on the same: After which, those Gentlemen returned over one of the Rods to the *Royal Society*, together with a Standard Weight of 2 Marcs, or 16 *Paris* Ounces, accompanied with a *Process Verbal*, or authentick Certificate from the proper Office, of the due Examination thereof.

The Rod being returned, Mr *Graham* caused Mr *Sisson* to divide both the Measure of the *English* Yard, and the *Paris* half Toise, each into 3 equal Parts, for the more ready taking off both the *English* and *Paris* Foot from the same: After which, both this Rod and the 2 *Marc* Weight sent over from *France*, were, together with the other Particulars before-mentioned, carefully laid up in the Archives of the *Royal Society*, where they now remain, as their Duplicates do in those of the *Royal Academy* of Sciences at *Paris*: But as, before they were so laid up, an accurate Examination and Comparison of them was made by Direction of the Council of the *Royal Society*, the Result of the same is here subjoined as follows: That is to say,

1. The *Paris* half Toise, as set off on the Standard in the *Royal Society*, contains *English* Inches by the same Standard 38.355. Whence it appears, that the *English* Yard and Foot is to the *Paris* half Toise and Foot, nearly as 107 to 114. For as 107 to 114, so is 36 to 38.35514.

2. The *Paris* two *Marc*, or 16 Ounce Weight, weighs *English* Troy Grains 7560. Whence it appears, that the *English* Troy Pound of twelve Ounces, or 5760 Grains, is to the *Paris* two *Marc*, or 16 Ounce Weight, as 16 to 21: That the *Paris* Ounce weighs *English* Troy Grains 472.5, and that consequently the *English* Troy Ounce is to the *Paris* Ounce, as 64 is to 63.

3. The *English* *Avoirdupois* Pound weighs Troy Grains 7004, whence the *Avoirdupois* Ounce, whereof 16 make a Pound, is found equal to 437.75 Troy Grains: And it follows of Consequence, that the Troy Pound is to the *Avoirdupois* Pound, as 88 to 107 nearly; for as 88 to 107, so is 5760 to 7003.636; that the Troy Ounce is to the *Avoirdupois* Ounce, as 80 to 73 nearly; for as 80 to 73, so is 480 to 438; and lastly,

lastly, that the *Avoirdupois* Pound and Ounce is to the *Paris* two *Marc* Weight and Ounce, as 63 to 68 nearly; for as 63 to 68, so is 7004 to 7559.873.

4. The *Paris* Foot, expressed in Decimals, is equal to 1.0654 of the *English* Foot, or contains 12.785 *English* Inches.

V. When there were some Time since prepared by Order of the *Royal Society*, to be kept in their Archives here, and also in those of the *Royal Academy of Sciences* at *Paris*, Standards of the *Yard Measure*, as also of the *Troy* and *Avoirdupois Weights*; an Account of which was some Months since published by Order of the Council of the Society: It was not at all the Intention of the Society, to determine what was the absolute legal Length of the *Yard*, or the real and legal Weight of the said several *Pounds*; but only to lodge and preserve, in those respective Places, 2 Measures, and 2 Sets of those Weights, sufficiently near to what were in common Use, and well agreeing with each other, for the Purpose of comparing together, by some certain Standard, to which Recourse might be had in either Kingdom, the Success of such Experiments made either in *England* or in *France*, in which Measure or Weight might particularly be concerned.

And for the same Reason, the Gentlemen of the *R. Acad. of Sciences*, were pleased to take Care to have the Length of their *half Toise* set off on both the Brass Rods, upon which the *English Yard* had been already laid off, and to provide 2 Brass Weights of two *French Marcs* each; one of which was sent over hither, when one of the Brass Rods, just mentioned, was again returned over to the Society. And it was the Proportion only between these several Standards, that was proposed to be laid down in the said Paper, without intending thereby to ascertain the just and legal Proportions between the Weights and Measures of both Nations. Though it is not to be doubted, but that this Measure of the *French half Toise*, and the *French two Marc Weight*, are, like the *English*, sufficiently agreeable to what are there constantly used.

But as some Gentlemen have since been desirous to know, how far those Standards really agreed with the original ones, as they are looked upon to be, in the *Chamberlain's Office* of his Majesty's *Exchequer*, as well as with those kept for publick Use, at *Guild-Hall*, at *Founders-Hall*, with the *Watch-makers Company*, and in the *Tower of London*, Mr *George Graham*, F. R. S. was thereupon requested, with such other Assistance as he should find necessary, to take upon him the Comparison of the said several Standards; which he has accordingly done, and carefully viewed and examined the same, at the *Exchequer*, on Friday the 22d of *April* last, in the Presence of the President, the R. Hon. the Earl of *Macclesfield*, the R. Hon. the Lord *Charles Cavendish*, *John Hadley*, Esq; *William Jones*, Esq; *Peter Daval*, Esq; and *Cromwell Mortimer*, M. D. one of the Secretaries; and at *Guild-Hall*, *Founders-*

An Account of a Comparison lately made by some Gentlemen of the Royal Society, of the Standard of a Yard, and the several Weights lately made for their Use; with the original Standards of Measures and Weights in the Exchequer, and some others kept for publick Use, at Guild-Hall, Founders-Hall, the Tower, &c. No. 470. p. 541. Read June 16, 1743.

* See the preceding Article.

Hall, and the *Tower*, on the *Wednesday* following, the 27th of the same Month, in the Presence of all the same Persons, Mr *Daval* only excepted, who happened to be otherwise engaged that Day. All which Gentlemen were received with the greatest Civility and Regard, by the several Officers who have the Care and Keeping of the respective Standards in Question; who most readily favoured them with the free Use and Inspection of the same; and several of which were themselves also pleased to attend the Examination.

And, as the Council of the Society have now thought fit to direct an Account to be here published of these Trials and Experiments, we shall first, for Order-sake, begin with the *Measure* of the *Yard*; and then proceed to what concerns the several Weights of the *Troy* and *Avoir-du-pois* Pounds.

The Standards of Length now used in the *Exchequer*, are two squared Rods of Brass, of the Breadth and Thickness of about $\frac{1}{2}$ an Inch; the one called the *Yard*, and the other the *Ell*. The Ends of neither are exactly flat and parallel; or, if they were so once, they have since suffered some Bruise or Damage, and that possibly by the impressing near each End the Seal of a crowned *E.*; by which it appears, they were placed here during the Reign of Queen *Elizabeth*, and, probably, at the same Time when the several Standard-Weights, hereafter mentioned, were lodged here also.

To these Rods there belongs a substantial Brass Bar, of about the Length of 49 Inches, the Breadth of $1\frac{1}{2}$ Inch, and the Thickness of an Inch: On one Edge of this Bar is a hollow Bed or Matrix, fitted to receive the square Rod of a *Yard*; and on another, a like Bed fitted to receive that of an *Ell*: And into these Beds they usually fit the *Yard* and *Ell* Measures brought to be examined and sealed at this Office. The square *Yard* and *Ell* Rods fit sufficiently well into these respective Beds, so as neither to rub or shake very sensibly; yet, as neither the Ends of the Rods, or of the hollow Beds, are accurately flat and parallel, the greatest Lengths of those Beds must, of Necessity, be somewhat greater than the greatest Lengths of the Rods intended to be placed in them: By which greatest Lengths of those Rods, and which were looked upon by all the Gentlemen present, as the real and proper Lengths of those Rods, are meant the Distances of 2 parallel Planes or Cheeks, so placed as to touch the Rods respectively at both Ends.

Besides all which, there also remains in this Office an old eight-sided Rod of Brass, of the Thickness of about $\frac{1}{2}$ an Inch, very coarsely made, and as rudely divided, into 3 Feet, and one of those Feet, into 12 Inches. This is marked near each End with an old *English* *H* crowned; and is supposed to have been the old Standard of a *Yard*, lodged there in the Time of King *Henry* the Seventh, and used as such, till the other above-mentioned, and now accounted the Standard, was made to supply it's Place.

Now,

Now, as the *Yard* is from very old Time mentioned in our Acts of Parliament, as containing *three Feet*, or *36 Inches*; and the *Ell* is not therein particularly described, though universally reputed equal to *one Yard and a Quarter*, or to *45 Inches*; we shall in the following Comparison suppose, that the Length of the square Brass *Yard Rod*, here kept, and marked with a crowned *E.* by that Length meaning, as above, it's greatest Length between 2 parallel Planes, to be the true and genuine Length of the *English Yard*, or of *3 English Feet*: And with that Length we shall compare the others here mentioned, expressing how much they respectively exceed, or fall short of, this supposed Standard Measure.

To examine all which, Mr *Graham* was provided with very exact and curious Beam-Compasses of different Sorts, and adapted to the several Purposes they were to be used for. One of these was by parallel Cheeks intended for the taking the Lengths of the Standard Rods above-mentioned to be kept in the *Exchequer*: Another was by rounded Ends, one of which was moveable, designed to take the Lengths of such Standards as consist of hollow Beds or Matrices, like those already spoken of at the *Exchequer*, and the others, to be presently mentioned, at *Guild-Hall*: And a third Beam-Compass was fitted in the common Way, with fine Points, for the taking off, or laying down, such Measures as are marked out by the Distance of Points or Lines, on any plane flat Superficies. All which Compasses were severally so contrived, as to be lengthened by the turning of a fine Screw, one of whose Revolutions answered accurately to the 40th Part of an *Inch*, and to which there was applied an Index, shewing, on a small circular Plate with 20 Divisions, the broken Part of a Revolution; and whereon the Place of the Index might, by the Eye, be estimated to about the 10th Part of a Division; whereby the Motion of the moveable Cheek, End, or Point, might consequently be judged of, to about the 8000th Part of an *Inch*.

But Mr *Graham*, when he determined by these Instruments the following Particulars, desired it might be observed, that although the Alterations of the Compasses were sensible to so small a Quantity, it was not to be supposed the Measures here taken with them, could be estimated to the same Exactness. The Hand cannot judge with so much Nicety, of the Shake of a Rod, when applied between the Cheeks, or when let into one of the hollow Beds or Matrices above-mentioned: Neither can the Eye, though assisted with a magnifying Glass, pretend to see, with that Accuracy, the Place of the Compass Points, when applied to the taking off a Measure, set out by Points or Lines, on the plane Surface of a Rod or Rule. All he therefore thinks possible, and that he has found he could several Times together, under the same or like Circumstances, be consistent in, is to take such Measures to about the 1600th Part of an *Inch*.

We shall, however, in what follows, give those Measures as they actually did come out, in Revolutions, Divisions, and Tenths: All which

which are also, for the Convenience of the Reader, in a second Column, reduced to the common *Decimals* of an *Inch*; and, in a third, to the *Vulgar Fractions* of the same.

It may further be noted, that the absolute Quantity of all Measures, any Ways inscribed on Standards of Metal, must, from the Nature of Things, vary with the Alterations in the Heat or Coldness of the Weather; and, for that Reason, the exact Proportion between any two Standards, taken at different Times, cannot be expected to be found the same to the most perfect Degree of Exactness, unless the Temperature of the Air shall at those different Times have been the same, or that a proper Allowance has been made for the Alteration of it. Yet, in the present Case, as all the several Measures referred to, are inscribed on the same Metal, Brass, as none of the Differences we are concerned about are very great, and as the Change of the Weather was not very considerable between the Days of Trial, it has been thought this last Consideration might be safely neglected, in setting down the following Particulars: Which are, that

The greatest Length of the Matrix of the Yard Measure, at the Exchequer, exceeded the square Standard Yard by	Rev.	Div.	
	0 :	8,2 = .0102 =	$\frac{1}{97.56}$
The Yard inscribed on the Royal Society's Rod, exceeded the same by -	0 :	6,0 = .0075 =	$\frac{1}{133.3}$
The old Brass Standard at the Exchequer, marked with the crowned H, fell short of the same by - - -	0 :	5,7 = .0071 =	$\frac{1}{140.3}$
The Standard Ell Rod, at the Exchequer, exceeded 45 Inches, of such as the Standard Yard contains 36, by	1 :	19,5 = .0494 =	$\frac{1}{20.25}$

At *Guild-Hall*, the Standards of long Measure there used, are only two Beds, or Matrices, the one of a *Yard*, and the other of an *Ell*, cut out of 2 of the Edges of a substantial Brass Bar, much like that at the *Exchequer*, but not altogether so thick; which Bar is sealed with the *Exchequer* Seal, and marked at both Ends with *C. R.* crowned; and also, as it seems, with *W. M.* crowned in like Manner. But there are here no Rods fitted to these Beds; so that all that seemed requisite and proper to be done, was to take both the greatest Lengths of these Beds, and also the least Lengths of the same; the last being nearly the Lengths of such square Rods as might be so fitted into the Beds, as to go in every Way close, and without sensibly shaking: And, upon taking the said Measures, it appeared, that

The greatest Length of the Yard Bed, at Guild-Hall, exceeded the Standard Yard, at the Exchequer, by	Rev.	Div.	
	1 :	14,7 = .0434 =	$\frac{1}{23.04}$

The least Length of the same Bed, exceeded the said Standard of a Yard by - - - - -

$$\left. \begin{array}{l} \text{Rev.} \\ 1 : 11,7 = .0396 = \frac{1}{25,2} \end{array} \right\} \text{Div.}$$

The greatest Length of the Ell Bed, at Guild-Hall, exceeded 45 Exchequer Standard Inches by - - - - -

$$\left. \begin{array}{l} \text{Rev.} \\ 1 : 15,5 = .0444 = \frac{1}{22,5} \end{array} \right\} \text{Div.}$$

The least Length of the same Bed exceeded the same Number of like Inches by - - - - -

$$\left. \begin{array}{l} \text{Rev.} \\ 1 : 0,7 = .0258 = \frac{1}{38,6} \end{array} \right\} \text{Div.}$$

The Standard of a Yard, in the Tower of London, belongs to his Majesty's Office of Ordnance, and is kept in the Drawing-Room there: It is a solid Brass Rod, about $\frac{7}{10}$ of an Inch square, and about 41 Inches long; on one Side of which is laid off the Measure of a Yard, divided into 3 Feet, and each Foot into 12 Inches: The first Foot has the Inches divided into Tenths, the second into Twelfths, and the third into Eighths of an Inch, and the first Inch of all is divided into 100 Parts, by diagonal Lines. This Rod is said to have been provided by the late Mr Rowley; it is sealed with the Exchequer Seals, and two other Seals of G. R. crowned, near one of the Ends, together with his Majesty's Mark, commonly called the Broad Arrow. And the Length of the Yard, or of the 3 Feet inscribed upon it, exceed the forementioned Exchequer Standard of a Yard by - - - - -

$$\left. \begin{array}{l} \text{Rev.} \\ 0 : 8,9 = .0111 = \frac{1}{90} \end{array} \right\} \text{Div.}$$

The Standard Yard, belonging to the Clock-makers Company, was delivered to them from the Exchequer, by Indenture, the 4th of September, 23 Car. II. A. D. 1671. It is a Brass Rod of 8 Sides, near $\frac{1}{2}$ an Inch in Thickness, sealed with the Exchequer Seal, and C. R. crowned, near each End; and whereon the Length of the Yard is expressed, by the Distance between 2 upright Pins, or small Cheeks, filed away to their due Quantity: This was procured by Mr Graham, to be brought to the President's House of the Royal Society, on Saturday the 7th of May last, where all the above-named Company then met, to collate their respective Notes of these several Trials, all which were found to agree with each other: At which last Meeting, Mr John Machin, of Gresham College, the other Secretary of the Society, was present also: And the Length of this last Yard Measure was then tried, and found to fall short of the Exchequer Standard Yard Measure, now very carefully added on the middle Line of the Royal Society's Brass Rod,

$$\left. \begin{array}{l} \text{Rev.} \\ 0 : 16,8 = .021 = \frac{1}{47,62} \end{array} \right\} \text{Div.}$$

Now, as to the Weights, those in the Chamberlain's Office in his Majesty's Exchequer, and which are esteemed the Standards, are a Pile, or Box, of hollow Brass Troy Weights, from CCLVI Ounces downwards, to the 16th Part of one Ounce, all severally marked with a

2

crowned

A Comparison of Weights and Measures, &c.

crowned E. : But they have no *Penny-weights*, or *Grain-Weights*, that are any Ways esteemed or looked upon as Standards.

The Weight mentioned in all our old Acts of Parliament, from the Time of King *Edward* the First, is universally allowed to be the *Troy* Weight, whose *Pound* consisted of 12 *Ounces*, each of which contained 20 *Penny-weights* : And as the *Pound* is the Weight of the largest single Denomination commonly mentioned in those Acts, 12 *Ounces* taken from the Pile of *Troy* Weights above-mentioned, as there is no single *Troy Pound* Weight, must now be reputed the true Standard of the *Troy Pound*, used at this Day in *England*.

Besides which *Troy* Standards, there are also kept in the *Exchequer* the following Standards for *Avoirdupois* Weights: That is to say, a 14 *Pound* Bell Weight of Brass, marked with a crowned E. and inscribed

XIII. POUND AVERDEPOIZ.

ELIZABETH. REGINA.

1582.

as also a 7 *Pound*, a 4 *Pound*, a two *Pound*, and a single *Pound*, like *Avoirdupois* Bell-Weights, and severally marked as follows, excepting the Variations for the Number of *Pounds* in each respective Weight.

VII. A.

AN^o

D^o



E. L.

1588.

A^o REG. XXX.

With which are also kept a Pile of flat *Avoirdupois* Weights, from 14 *Pounds* down to the 64th Part of a *Pound*.

When the *Avoirdupois* Weight came first to be looked upon as a lawful Weight, does not appear; but by these Standards it is plain, it has been used as such, ever since the Reign of Queen *Elizabeth*. And as the Weight of 15 *Pounds Avoirdupois*, has before been made use of, in determining the Proportion between the Weight of this *Pound* and that of the *Pound Troy*, we shall begin by giving the Counterpoise of the said 15 *Pound Avoirdupois*, as it was found in *Troy* Weight: From whence we shall deduce the Proportions of those *Pounds*, and afterwards compare the same with the like Proportions, deduced from the 7 *Pounds*, and single *Pound* Bell-Weights, and the single *Pound* flat Weight above-mentioned: All which Weights were taken in the Presence of the above-named Noblemen and Gentlemen, by Mr *Samuel Read*, Scale and Weight-maker near *Aldersgate*, who brought to the *Exchequer* a large Balance of his own for that Purpose, and which, when loaded with 15 *Pounds* at each End, was very readily turned with six *Grains*; as a lesser one he brought also for examining the single *Pound* Weights, was with $\frac{1}{2}$ a *Grain*. He also brought with him what he called his own Standard *Penny* and *Grain* Weights, to supply what was necessary to make

make the Counterpoise of the *Exchequer* Weights: With all which the Result was, that

The Standard 14 Pound, and single Pound *Avoirdupois* Weights, taken together, were, upon a Medium of four Trials, after counterchanging the Weights in each Balon, changing the Balons, and then again counterchanging the Weights, found to be counterpoised by 218 Troy Ounces, 13 Penny-weight, 23 Grains, and one Fourth. From whence the *Avoirdupois* Pound is deduced equal to 6998.35 of such Grains as the Troy Ounce is reputed to contain 480 of; and the *Avoirdupois* Ounce, of which 16 are supposed to make a Pound, is found equal to 437.4 like Grains.

Again: The seven Pound Bell *Avoirdupois* Weight, with the same Scales, and upon a Medium of 4 like Experiments, counterchanging, as before, both Weights and Balons, was found to be counterpoised by 102 Troy Ounces one Penny-weight, and 21 Grains. According to which, the *Avoirdupois* Pound comes out equal to 7000.7, and the Ounce to 437.54 Troy Grains.

Again: The single Bell *Avoirdupois* Pound, with the lesser Scales, on the Medium of two Experiments, counterchanging the Weights, the Balons not being moveable, was found to weigh 14 Troy Ounces, 11 Penny-weight, and 18 Grains; or was equal in Weight to 7002, and the Ounce to 437.62 Troy Grains.

The single *Avoirdupois* Bell Pound, against the flat *Avoirdupois* Pound Weight, was found, on a Medium of 2 like Experiments, to be heavier by $2\frac{1}{2}$ Troy Grains: Whence the flat *Avoirdupois* single Pound Weight weighs only 6999.5, and the Ounce 437.46 Troy Grains.

The Royal Society's *Avoirdupois* Pound was, in like Manner, found to be lighter than the *Exchequer* single Bell Pound Weight, by one Grain.

And their Troy Pound Weight to be lighter than the 8 and 4 Ounce Troy Weights at the *Exchequer*, taken together, by half a Grain.

The Founders Company of London are, by their Charter from King James the First, authorized and directed to have the sizing and marking of all Manner of Brass Weights, to be made or wrought, or to be uttered, or kept for Sale, within the City of London, or 3 Miles from the same. And the Weights delivered to them from his Majesty's *Exchequer*, and now kept in their Hall, as their Standards for the Uses above-mentioned; are a Pile of flat Brass Troy Weights, from CCLVI Ounces, down to the 16th Part of an Ounce, all sealed with the *Exchequer* Seal, and marked with C. R. crowned, 1684, and a Stamp of the initial Letters of the Maker's Name: As also a Set of Bell Brass *Avoirdupois* Weights, sealed and marked in like Manner. And here the following Trials were made, before the above-named Gentlemen, by Mr Read, but with a large Balance, commonly used for Trials at the Hall, in their Office for that Purpose; and found to turn with about the same Weight as the former; and also with a lesser one, turning in like Manner under these Circumstances, with about $\frac{1}{2}$ a Grain, which Balance belonged likewise

to the Hall, as did also the Penny and Grain Weights made use of, but which were not kept by them as Standard Weights.

And here it was found, that, on a Medium of four Trials, made in like Manner as before, at the *Exchequer*, that 15 Pounds *Avoirdupois*, being their 14 Pounds, and single Pound Standard Weights, were counterpoised by 218 Troy Ounces, 15 Penny-weight, and 23 Grains: Whence the *Avoirdupois* Pound is deduced equal to 7001.53, and the Ounce to 437.59 Troy Grains.

Again: The single *Avoirdupois* Standard Pound weighed, on a Medium of 2 Experiments, counterchanging the Weights, as before, 14 Troy Ounces, 11 Penny-weight, 16 $\frac{1}{2}$ Grains: Or was equal to 7000.5, and the Ounce to 437.53 Troy Grains.

Again: This Standard *Avoirdupois* Pound, at a Medium as before, outweighed the *Royal Society's Avoirdupois* Pound, by 2 $\frac{1}{8}$ Grains: And the Troy Standards of 8 and 4 Ounces, taken together, outweighed the *Royal Society's* single Troy Pound Weight, by 2 $\frac{1}{8}$ Grains and $\frac{1}{16}$, at a like Medium.

At his Majesty's Mint in the Tower of London, their Standard Weights are only a Pile of Troy hollow Weights, from CCLVI Ounces, down to the 16th Part of one Ounce, without any Penny or Grain Weights. The larger of these Weights, as low as the VIII Ounce-weight, are marked with *A. R.* crowned, and inscribed PRIMO MAIL, A° DNI. 1707. A° REGNI VI°. The IIII and the II Ounce Weights are only marked with *A. R.* crowned, without the Date; and the lesser have only the *Exchequer* Seal, and the Rose and Crown, being the Mark of his Majesty's Mint, as all the larger ones have also. And here it was found by Mr Joseph Harris, one of the *Affay-Masters* of the Mint, with a very curious Balance of his own, fixed in a Glass Lantern, and which he was well assured might in such Circumstances be depended upon to less than $\frac{1}{2}$ a Grain; and with the Addition of so many Penny and Grain Weights belonging to his Office as were necessary: That

The *Royal Society's* whole Troy Pound Weight weighed, at a Medium, less than the 8 Ounces and 4 Ounces of these Standards, taken together, by 2 $\frac{1}{8}$ Grains.

That the *Royal Society's Avoirdupois* Pound weighed in Troy Weight by these Standards, 14 Ounces, 11 Penny-weight, 16 $\frac{1}{2}$ Grains, or 7000.87 Grains.

That the *Royal Society's* Pile of 16 Ounces Troy, was lighter than 16 Ounces of these Standard Weights, by 4 $\frac{1}{2}$ Grains.

And, lastly, that the *Royal Society's* 8 Ounces and 4 Ounces together, taken from their Pile, weighed lighter than their single Troy Pound Weight, by $\frac{1}{8}$ of a Grain.

*A Method of
making a Gold-
coloured Gla
zing for
Earthen Ware,
by M. Gode-*

VI. Take of Litharge Parts iij. of Sand, or calcined Flint p. i. pound and mix these very well together, then run them into a yellow Glass with a strong Fire. Pound this Glass, and grind it into a subtile Powder, which moisten with a well saturated Solution of Silver, make it

it into a Paste, which put into a Crucible, and cover it with a Cover. Give at first a gentle Degree of Fire, then increase it, and continue it till you have a Glass, which will be green. Pound this Glass again, and grind it to a fine Powder; moisten this Powder with some Beer, so that by Means of an Hair Pencil, you may apply it upon the Vessels [or any Piece of Earthen-Ware]. The Vessels that are painted or covered over with this Glazing, must be first well heated, then put under a Muffle, and as soon as the Glass runs, you must * smook them, and take out the Vessels.

fridus Hein-
sius, *Astron.*
Prof. at St
Petersburgh.
No. 465. p.
188. Read
Nov 11,
1742.

VII. As a beautiful and regular Form of Body renders a Person agreeable; so, on the contrary, Deformity of Body not only produces Weakness, but sometimes is the Cause of Ridicule amongst such unthinking People as will not remember, *That it is He that made us, and not we ourselves.*

*The Description
and Uses of the
Steel-yard Ba-
lance Swing,
invented and
made by Mr
Timothy Shel-
drake. No.
462. p. 20.
Read Jan. 21,
1741 2.*

For the foregoing Reasons, and to prevent such bad Consequences as the above-mentioned, it would be much to the Advantage of crooked Persons, if any Method could be found for giving them any Help, by endeavouring to regain the original Symmetry of Parts, which, by it's Commonness, is not sufficiently esteemed, though justly valued by such as Crookedness has unhappily deprived thereof.

Where Crookedness is caused by bad Accidents, as Falls, breaking of Bones, or any such Causes, attended with Neglect; there it is to be feared no Help can be given. But where a Deformity of Body is owing to some Defect of Health, ill Habit of Body, or some internal Cause, I hope it is in the Power of Art and Care to prevent growing worse; or with good Care and Endeavours, to recover entirely: For doing which, I hope, this *Steel-yard Swing*, now laid before this Honourable Society, will be thought an useful Invention for doing such Service, to crooked Persons, whose Bones are tender, and capable of having their Form a little altered.

The Body, as it is composed of Bones with Joints, covered with Muscles, &c. for moving the Body, as Necessity requires; so if any of these Muscles that are of Use for bending the Body forward, backward, downward, or raising it upward, or for turning Part of the Body to the right or left Side, have by Illness, want of proper Nourishment flowing so freely to one Side as the other, a careless Way of sitting or lying, been contracted on one Side of the Body, by which the Bones are braced closer together than Nature intended; in this Case, the Hip generally rises, the Shoulder on the same Side falls lower; the great Support of the Body, the *Vertebrae* of the Back, are altered from their natural Uprightness to a Curve, and the other Side extended to too great a Length: Thus the *Viscera* are pressed too close on the contracted Side, and probably hindered from performing their due Office; whilst on the contrary Side, which is extended beyond it's true Bounds, there is too much Room for them, that may give too

* *Afflare debes fumum.*

large a Growth to them, or render them too lax and weak: From this united ill State of the *Viscera*, it is possible that crooked Persons are generally unhealthy.

For removing this distorted Form, and recovering a better, this *Steel-yard Swing* is proposed, as a mechanical Method, for stretching the contracted Side, and giving Liberty to the too much extended Side to contract; that the Sides may thereby be brought to their original and regular Form, by suspending the crooked Person with Cords properly covered for Ease, and put under each Arm, and then placed at equal Distances from the Centre of the Beam. The Gravity of the Body will, in great Probability, immediately affect the contracted Side of the Body, so as to put the Muscles a little upon the Stretch; and if the Cord under the Arm on the longest Side of the Body be removed further from the Centre, the longest Side will become a Weight continually increasing, as the Point of Suspension is removed further from the Point of Motion; by which Means the shortest Side must be lengthened: Thus the *Vertebrae* of the Back will be gradually brought from their irregular Form, to a perpendicular; and the Head, that probably leaned too much to one Side, will rise upright.

The Child, or crooked Person, may hang suspended much longer upon this Swing, than by the Head in one of the semicircular Swings, which cannot extend the contracted Side in such Manner as this can, as will appear by the just Observation of this Instrument. It may be necessary to keep the Arms down, by a small Bandage round the Body and Arms a little above the Elbow.

By this Method of swinging a Child, it's own Weight must consequently stretch the contracted Muscles, &c. that draw the Shoulder and Hip too close together, and give Liberty to the Ribs to extend themselves to a greater Distance from each other; and at that very Moment of Time, the too much extended Side, by the Weight of the Body, will be pressed closer together; and by daily increasing the Time that the Person is upon the Swing, the desired Effect may be produced, an agreeable Form of Body recovered, and a healthy Constitution restored, to the Satisfaction of the Parents, and great Benefit of the once crooked Person.

Fig. 37.

A B C, Is the *Steel-yard Balance Swing*.

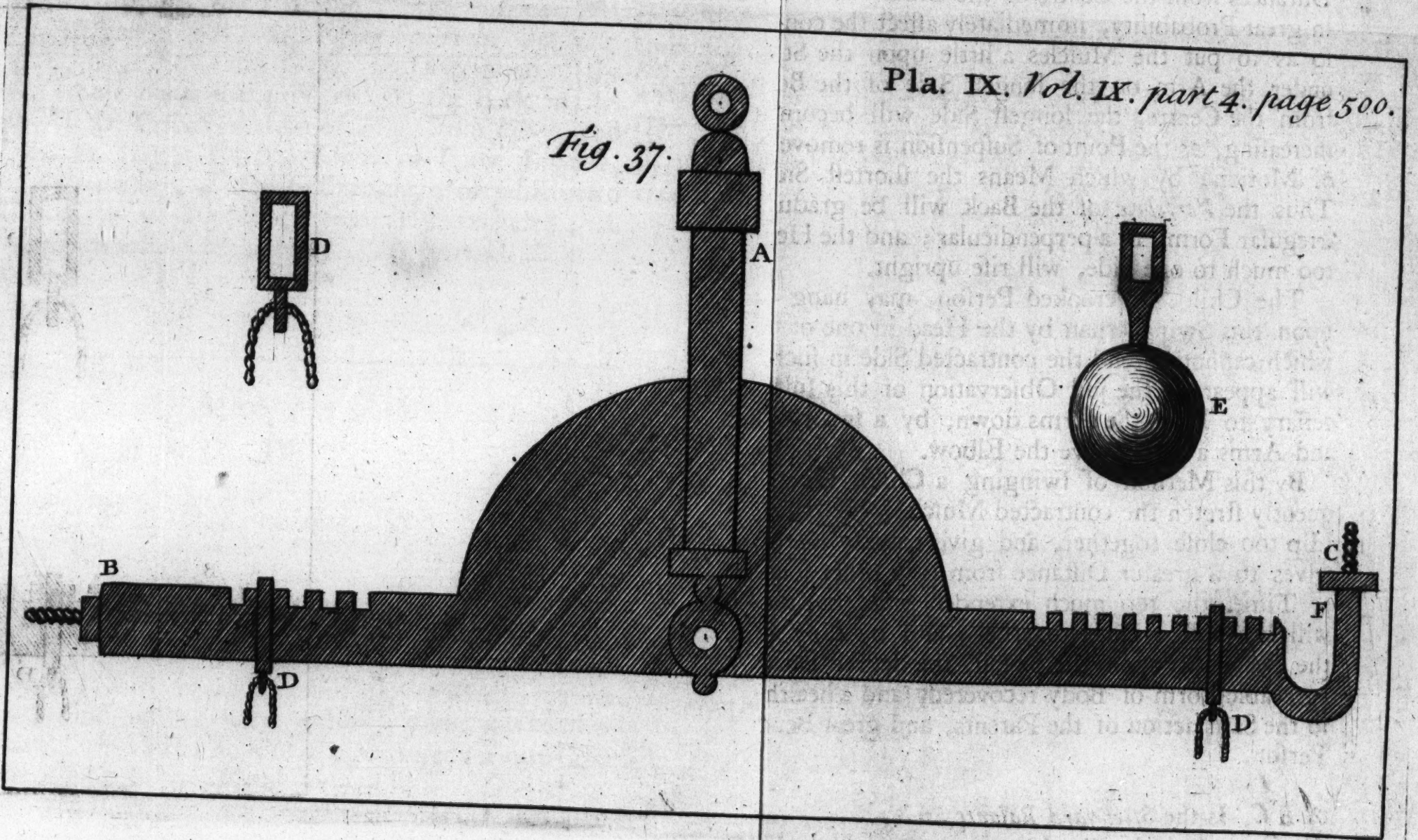
D, One of the square Iron Loops to which the Cords are to be fixed, and which Loops, one on each Arm of the *Balance*, are moveable from one Notch to another.

E, A Weight, to be hung upon the Arm *C* at *F*, to add to the Weight of the too much extended Side, as Occasion requires.

An Account, by
Dr Richard
Middleton
Massey, of a

VIII. This magnificent Work is to consist of four large Folio Volumes. The ingenious, curious, and most diligent Collector, takes in all Parts of Natural History, and gives us Descriptions and Figures of Things

Fig. 37.



np®

Things scarce ever seen or heard of before in *Europe*, which he has collected from all Parts of the World, with vast Charge as well as Industry.

The first Volume contains 111 Plates, besides the Author's Effigies, and the Decorations curiously engraven by the best Hands. He begins with the Anatomy and Skeletons of several Fruits, Leaves, and Roots: The Method of performing which, he communicated to the *Royal Society* some Time ago. He then goes on with a Description of several curious exotic Plants, with a particular Account of the *Zagoe Amboy-nensum*, *Marus Papyrifera*, &c. After these follow a great Variety of different Sorts of Animals from all Parts of the World. *Armadillo's*, *Ai*, or *Sloths*, *Spiders*, *Millepedes*, *Scorpions*, *Flying Squirrels*, *Opossums*, *Mice*, *Rats*, *Cats*, *Dogs*, large *Frogs* and *Toads*. A Description of the *Pipal*, a Sort of *Toad*, whose *Young* are produced on the Back of the Female. An Account of the Transformation of *Frogs* from *Fishes*, and back again from *Fishes* to *Frogs*. Several Kinds of scarce *Lizards*, *Iguana's*, *Chamaeleons*, *Salamanders*, *Tortoises*, *Crocodiles*; of which two last, some are represented in the Eggs, and some just excluded. A *Dragon* or *Basilisk* from *America*, with above fifty several Sorts of *Serpents*.

Book, entitled, *Locupletissimi Rerum Naturalium Thesauri, accurata Descriptio, &c.* Vol. I. Amstel. 1734. in Fol. An exact Description of the principal Curiosities of Nature, in the large Museum of Albertus Seba, F. R. S. Vol. I. Amsterdam, 1734. No. 434. p. 415. Sept. &c. 1734.

C H A P. IV.

P A P E R S omitted.

[Part i. Chap. III. add the following Article.]

JAN. 27, 1734, 6^h 23' p. m. I observed $\delta D \propto$. I found $\propto L 35'$ of $1^{\circ} 40' L$: *Venus* looked toward the S. and the Moon toward the N. 6^h 57' $\propto L = 26'$, and in this Observation a Line was drawn through *Venus*, and each Cusp of the *Falx* of the Moon, afterwards the Moon gradually departed farther from *Venus*.

A Conjunction of *Venus* with the Moon, by Jo. Frid. Weidler, F. R. S. observed at Wittenberg. No. 442. p. 267. July, &c. 1736.

[Part ii. Chap. I. add the following Articles.]

In a Letter dated at *Plymouth*, Nov. 30, 1739, Dr *Huxham* says, "We have had a very tempestuous Season for several Days past, though now fair; the *Mercury* lower [28.1 Inches] than I have known it for some Years, and the Tides excessively high."

Weather at *Plymouth*, by John Huxham, M. D. No. 460. p. &c. 1741.

672. Apr. Last

An Account of
an Earthquake
at Scarbo-
rough, on Dec.
29, 1737, by
Maurice John-
son, Esq; jun.
Secr. of the
Gentlemen's So-
ciety at Spal-
ding. No. 461.
p. 804. Aug.
&c. 1741.
Dated Spal-
ding, Jan. 7,
1737-8.

Last Thursday, the following Account of an Earthquake, which has very lately happened at Scarborough, was sent in a Letter from an Eye-witness, to a Gentleman here, was dated thence Dec. 30, 1737, in these Words:

“ The Ends of several Inclosures or Fields behind the Clift, on the Back of the Spaw, sunk down very low into the Ground, making a large Valley of a vast Length, and considerable Breadth, with five Cows then grazing on it (which they got out this Morning) the Weight of which shook and opened the Hill behind the House, after a frightful Manner, and forced up the Sands an hundred Yards in Length on each Side the Space, and twenty-seven broad, to the Height of six Yards, and in some Places ten Yards high.

“ The Pier, entire as it was, moved Sideways out of it's Place, and rose up about 5 Yards in the Air; the House fell down, and at the same Time took Fire.

“ The Flag-house, and wooden Rails, which were about the Mouth of the Well, were forced up in the Air above 10 Yards high, so that it is thought the Spaw-Water is entirely lost for ever*.

“ The Tide was out when this happened, and I was walking on the Spaw till after 12 o'Clock, when I saw the Sands beginning to rise about half a Foot: There were but few People there then, but in less than two Hours the Sands were covered with Men, Women, and Children, to see the Sands and Pier rise gradually; which they began to do about 12 o'Clock Yesterday Noon, and were at the Height I mention before it was dark, and continues so now.

“ No-body came by any Hurt, the People of the House getting away in Time; but all Dickey's† Household-Goods are lost, with a Cellar well stocked with Wine and Ale.”

[Part iii. Chap. IV. add the following Article.]

An Account of
some remarka-
ble Stones, taken
out of the Kid-
nies of Mrs
Felles, upon
opening her Body
after her De-
cease, by Noah
Sherwood,
Surgeon. No.
459. p. 610.
Jan. &c. 1741.

Upon opening the Body of Mrs Felles, I found nothing amiss in any of the Viscera, till I came to the Kidnies, both of which were considerably enlarged, and of an oblong Figure, and had several Protuberances bunching out, which made the Surface appear almost like a Beeve's Kidney. Upon feeling them externally, I could plainly perceive they were caused by Stones: I took them out of the Body, and laid them open longitudinally, and found in the right Kidney several Stones of an irregular Figure, branched like Coral: They had extended themselves beyond the Capacity of the Pelvis on every Side, (although that was greatly enlarged, so as each of them to contain half a Pint of Pus, or more) forming for themselves Cells in the Parenchyma of the Kidnies, which Cells were all ulcerated within, and full of Matter, com-

* N. B. The Spaw was soon after recovered as good as before.

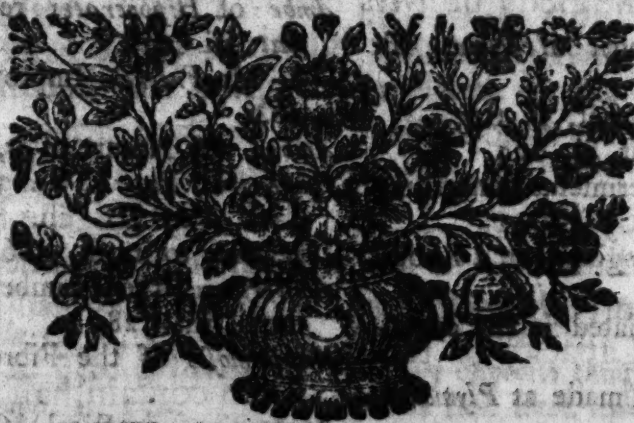
† Richard Dickinson.

municating with the *Pelvis*; the whole Substance of the Kidnies was scirrhus. The Patient had long been troubled with grievous Pains of the Back, and had voided great Quantities of *Pus* with all the Urine she made, so that there was no Doubt of there being Ulcers in her Kidnies; and she herself often declared there were Stones in the Kidnies, which, upon any Motion, she could feel grate against each other. The Bladder and Ureters seemed to be less hurt by so long a Discharge of Matter than might reasonably be expected, being only a little exco-riated; and indeed less than I have found in other seemingly parallel Cases, where the Matter has been of a more corrosive Nature; but in this Case it was thick and smooth.

The left Kidney was likewise full of Matter, and contained only one Stone, larger than any of those in the right, nearly of a triangular Figure, with the Angles growing pointed at their Extremities.

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